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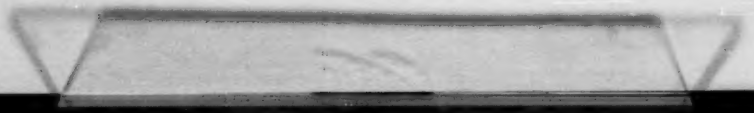

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VOLUME 8 • JULY 1950 • NUMBER 3 JOURNAL OF ORAL SURGERY

The treatment of cancer of the gums

■ *George S. Sharp, M.D., and Robert C. Wood, M.D., Pasadena, Calif.*

Fifty years ago, the attempts to eradicate gingival cancer by the then known methods of surgery and cautery were associated with such poor results that the surgeon welcomed the cooperation of the radiologist.[1,2,3] The improvement of technic soon made irradiation an alternative if not the preferred method of treatment,[4] but a satisfactory increase in the rate of cure was still lacking. During the last ten years, the newer chemotherapeutic agents and improvements in anesthesia have made it possible to perform block resections on portions of the gum, alveolar ridge and mandible or maxilla, and to reconstruct a mandibular defect with a bone graft. This procedure is now offered as the desired one for both prognosis and esthetic results.

The present report covers the experiences encountered in the treatment of 46 consecutive cases, of which 30 were seen in private practice from 1932 to 1944, inclusive. All patients who were examined are included, without selection.

The alveolar processes of maxilla and mandible and the roots of the teeth embedded therein are covered by connective tissue which in turn is protected by a stratified squamous epithelium. These two layers composing the gums are exceedingly thin and measure only 2 or 3 mm. in thickness. The gingival mucosa is the primary structure with which the present study is concerned. Periosteum covers the alveolar ridge, and the periodontal membrane (a specialized derivative of the periosteum) lines the alveoli. The alveolar ridge is made up of unique osseous tissue which is characteristically adaptable to the movements of teeth and changes during the life span. Numerous and varied tissues in such close proximity complicate the diagnosis as well as the treatment of many lesions.

Read before the thirty-first annual meeting of the American Society of Oral Surgeons, San Francisco, October 13-15, 1949.

1. Ochsner, A. J., The Treatment of Cancer of the Jaws. *Ann. Surg.* 76:328 (Sept.) 1922.

2. Crile, G. W., Carcinoma of the Jaws, Tongue, Cheek, and Lips. *Surg., Gynec. & Obst.* 36:159 (Feb.) 1923.

3. Bloodgood, J. C., Oral Cancer. *J.A.D.A.* 20:1790 (Oct.) 1933.

4. Quick, Douglas, Carcinoma of the Lower Jaw. *Am. J. Surg.* 1:360 (Dec.) 1926.

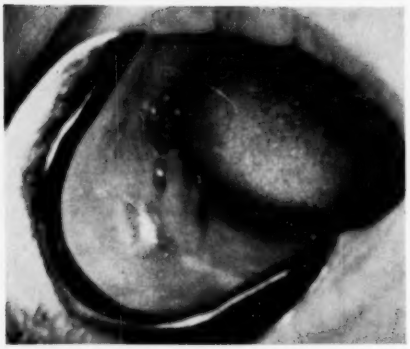

Fig. 1.—Early cancer of the right lower gum, measuring 1.0 cm. in diameter

The gum may be considered that portion of the fibrous tissue and dense mucous membrane which surrounds the neck of the teeth and extends over the medial and external surfaces of the alveolar ridges forming an immovable covering over the bone. Epithelial tumors developing in movable mucous membrane medially or externally are considered as arising from the floor of the mouth, the cheek, or the lip, respectively. Delineation between the gum and palate is less clearly marked. Labial and lingual frenum are considered with those structures rather than with the gum. Posteriorly, the gingival mucous membrane is tightly adherent to the periosteum for only a few millimeters behind the third molar alveolus. Around the neck of each tooth the mucous membrane forms a free, overlapping collar which joins the periosteum and the periodontal membrane. In or near this junction was the site of origin of the neoplasm in the majority of cases.

The lymphatic drainage differs in the upper and lower gums and also on their outer and inner surfaces; but for practical purposes, the differences are slight. The lymphatic anastomoses are in such an interconnected network that a palpable or clinically positive node in the submental, submaxillary, or upper carotid triangle calls for a radical block neck dissection of all of the five cervical triangles on the affected side. Anastomoses are present with the lymphatic drainage to the opposite side of the neck; in one case, bilateral cervical nodes developed during the clinical course of the disease.

■ *Diagnosis*

A gross differentiation of gingival lesions meets with considerable difficulty. It is, therefore, advisable to consider every abnormal elevated thickening, and all ulcers, tumors and granulomas, as possibly malignant, until their benign character has been conclusively demonstrated through biopsy and microscopic examination of the tissue specimen.

Early cancer of the right lower gum, measuring 1.0 cm. in diameter, is shown in Figure 1. The lesion was adherent to the alveolar ridge and clinically demonstrated early bone involvement, but roentgenograms were negative. The treatment consisted of resecting the alveolar ridge and plastic repair.

BENIGN ULCERS—The dental root abscess with accompanying gum boil is common in dental practice and is frequently confused with cancer. This mound-like, painful swelling occurs on the gum opposite a tooth root, either on the lingual or external surface. If it has ruptured, pus may be expressed from it. Extraction of the tooth will bring about

prompt healing and the disappearance of a possible precancerous lesion. Various types of benign ulcers are encountered on the gum; their exact identification is impossible without a biopsy. They are most common in periodontal disease and may occur as an overgrowth more often than as an ulcer, although the latter is the common end result. The clinical appearance of this disease is precisely like that of an early developing cancer of the gum, except that the inflammatory disease is not confined to one spot, or even to one gum. Periodontal disease deserves prompt treatment and observation until it is controlled. Chronic ulcers of a nonspecific nature are usually a result of pressure from dental appliances. The crater is frequently lined by a grayish film with a varying degree of inflammation around it. Specific ulcers are rarely seen on the gums, but a tuberculous ulcer is occasionally noted. Such extrapulmonary lesions are usually secondary to primary pneumonic disease. The onset is that of a low grade inflammatory process which quickly becomes secondarily infected. Syphilitic ulcers are rarely seen, and the majority are in the form of a chancre on the labial surface of the gums. Secondary moist papules may occur on these surfaces as well as elsewhere on the buccal surfaces. Their appearance is likewise not characteristic. Emphasis must be placed on the importance of a Wassermann and Kahn test, as well as a roentgenogram of the chest on all patients with an ulcer in the mouth. A biopsy is definitely indicated regardless of these tests, and microscopic examinations of such tissues may be positive for tuberculosis or syphilis.

Figure 2 shows a superficial squamous cell carcinoma of the left lower gum arising from leukoplakia. An advanced degree of leukoplakia covered the entire gum with cancerous changes in the midportion which caused a downward growth over the buccal surface. There was roentgenographic evidence of early invasion of bone. The Wassermann and Kahn reactions were positive. The treatment consisted of resection of the alveolar ridge and plastic repair.

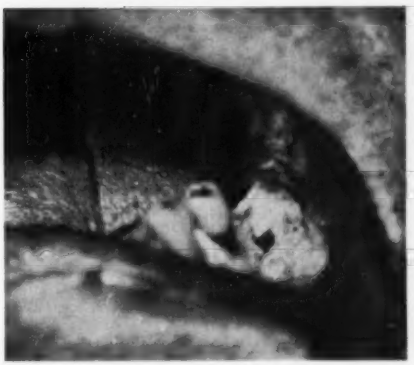

Fig. 2.—Superficial squamous cell carcinoma of the left lower gum, arising from leukoplakia

BENIGN TUMORS—The so-called papilloma is the most common epithelial tumor. On the gum it may simulate various types of papillary overgrowth, such as those encountered on the mucous membrane of other oral surfaces. These lesions are connective tissue outgrowths covered by squamous epithelium, which may develop on a broad or narrow base. In the early stage, they have the appearance and consistency of the surrounding normal mucosa; later, however, the tumor becomes firm and, when irritated, is fre-

quently covered by leukoplakia. Removal and microscopic examination are recommended for all such precancerous lesions. The hemangioma, fibroma and myxofibroma rarely occur on the gums. They are characteristic in appearance and offer no particular diagnostic problem.

The term epulis is no longer of value except as a descriptive word for an outgrowth from the gum surfaces. It is preferable to classify gingival tumors according to their clinical and histologic characteristics. The alveolar giant cell tumor is commonly found as a more or less pedunculated, firm growth with a base attachment on the margin of an alveolus. In the early stage, it is a deep bluish-red, fibrous and firm, without ulceration. Injury causes ulceration, and the lesion may then simulate cancerous changes. The central type of alveolar giant cell tumor causes a loosening of the tooth, and eventually ulceration appears on the gum surface. These tumors invade the bone; diagnosis by biopsy should be made promptly. The treatment consists of local removal and roentgen therapy, or removal of the tumor, extraction of adjacent teeth and thorough cauterization of the entire region.

Leukemia causes frequent secondary lesions on the gums. The gingival lesions may be the first objective sign of the disease; the gums appear swollen, bluish-red in color and granulomas of varying size are present along the alveolar margins. Biopsy from these areas will show a leukemic infiltrate or lymphosarcoma. Metastatic cancer rarely presents itself on the gum as an ulceration, but we have two cases of cancer of the breast which developed such lesions.

GRANULOMA OF PREGNANCY—Exuberant granulation tissue is commonly found during pregnancy, and development is rapid. The lesions are associated with loosening of teeth and with periodontal disease. The history, therefore, is characteristic, and the appearance is usually that of a deep red, granular, pedunculated, soft, noninfiltrating surface overgrowth. This granuloma may be treated by local removal with superficial desiccation or with roentgen therapy.

DILANTIN HYPERPLASIA—A certain small percentage of patients taking sodium diphenylhydantoin for central nervous system diseases, such as epilepsy, will show a reaction to the drug manifest by gingival hyperplasia which consists of an overgrowth of the submucosal fibrous tissue covered by normal or thickened mucosa. Some areas may become pedunculated and drop off, followed by regrowth in the same area. The gums return to normal when the drug is discontinued.

■ *Etiology*

Cancer of the gum is almost always a primary growth.[5,6] It is more frequent in men (about 63 per cent) than in women (about 37 per cent). The disease is rarely observed in persons under 40 years of age. In our series the greatest number of cases appeared between 50 and 70 years. The youngest patient was 34, and the oldest 89. The average age for the group was 65 years; the same for both males and females.

5. Goldman, H. M., and Grady, H. G., Adenocarcinoma of Gingiva Infiltrating the Mandible and Metastasizing to Cervical Nodes. *Am. J. Orthodontics (Sect. Oral Surg.)* 31:189 (March) 1945.

6. Loeb, M. J., Adenocarcinoma Originating From Aberrant Tissue in Gingiva. *J.O.S.* 1:347 (Oct.) 1943.

The true cause of gingival cancer is no better understood than that of malignant disease arising in any other portion of the mucous membrane of the mouth; but nowhere else in the oral cavity can the chain of events leading to cancerous transformation be studied more easily. It is in this instance that prophylaxis may afford the patient the greatest benefit. Concededly, it is impossible to prove that in a particular case malignant transformation has been averted by measures of this kind. However, as long as the true cause of cancer has not yet been determined, attention should be directed along those lines which may have a bearing on the subsequent development of cancer.

Contributing factors are similar to those observed for growths elsewhere in the oral cavity, but specific instances are particularly demonstrated in older individuals who have sustained continued, chronic irritation. More commonly, the cumulative effect of several forms of chronic irritation, namely, periodontal disease, inflammation, denture irritation and lack of vitamin B, play an important role.

Some form of tobacco was used by 75 per cent of the patients. This percentage is comparable with the incidence of this habit in the general male population; it is, therefore, of little etiologic significance.

The causal relationship between partial or complete dentures to cancer of the gum is at first glance definite; but after careful analysis, this may not be real, or completely understood. It is natural for all patients who develop cancer of the gums in relation to dental appliances to assume without question that the latter was a definite etiologic factor rather than a secondary inciting factor. Hypertrophy of gingival tissue is a common occurrence in the edentulous mouth. The surfaces of the gums are marked by folds, fissures and slight ridges, and frequently erosions and inflammation are also present. As the surface contour of the gum changes, redundant tissue proves abnormally firm due to irritation from a denture which is not adjusted from time to time to these hypertrophies of mucous membrane and connective tissue. Typically, a deep fissure occurs where a flange of the denture fits into one of these grooves, and an abnormal tissue response results with continued use of the denture. Actually, if the discontinuance of the denture does not cause such areas to regress completely in a short period of time, it is advisable to perform a surgical excision of the hypertrophied and redundant gum tissue.

A papillary squamous cell carcinoma of the right lower gum is illustrated in Figure 3. It measured 1.5 by 1.0 cm. There was no roentgenographic evidence of bone invasion. The two right incisor teeth were extracted for adequate exposure, and the lesion was treated by peroral roentgen therapy. The region healed promptly without radiation changes, and no evidence of malignant disease was present four years later when coronary disease caused the patient's death.

The one established precancerous lesion of mucous membrane rarely observed on the gums is leukoplakia.[7] When this epithelial condition is present, it is aggressive; microscopic studies will show a hyperkeratosis with dyskeratosis, the typical microscopic features of a malignant lesion. The etiologic factors for leuko-

7. Stacey, A. J., Jr., Epidermoid Carcinoma of the Lower Gingiva. *Mississippi Doctor* 23:496 (Dec.) 1945.

Fig. 3.—Papillary squamous cell carcinoma of the right lower gum

plakia are the same as those for epidermoid cancer, and approximately 50 per cent of our cases were found to have oral leukoplakia with their associated cancer of the gum. Aside from this close affinity between leukoplakia and cancer, an etiologic link has not been demonstrated.[8] The treatment of leukoplakia is preferably conservative, as, for instance, improvement of oral and dental hygiene, adjustment of ill-fitting dentures and the discontinuance of tobacco in all forms. All patients with leukoplakia should be kept under close observation.

The site of origin for most of the malignant growths was rather difficult to determine because of the advanced stage on admission. The position of the smaller lesions, however, led to the conclusion that the majority (70 per cent) were on the external surfaces rather than the lingual side. Further, the alveolar crest or apex of the gum was by far the most common primary site among the early lesions. Extension was rapid, and 90 per cent of the primary lesions had invaded beyond the boundary of the gums on the initial examination.

Figure 4 shows two simultaneous primary cancers of the left lower gum. The anterior lesion measured 1 cm. in diameter, and was superficial, without evidence of bone invasion. The posterior lesion measured 2 by 2 cm., and appeared papillary and superficial, with extension down the lingual surface for a short distance. The mucous membrane between the two lesions appeared normal, and microscopic study of the region showed that the two were not in any way connected. Roentgenograms revealed no evidence of bone involvement. A resection of the body of the left mandible was performed, and two months later a bone graft was fitted into the defect to permit normal function.

■ *Clinical Characteristics*

The differences between cancer of the gum and malignant tumors originating in other parts of the oral cavity can largely be explained on an anatomic basis. The primary lesion is from the onset in close proximity to bone, and invades it at an early date. This applies especially to the alveoli of extracted teeth. Lateral extension is also great; and as the mucous membrane of the gums is continuous with adjacent structures, early spread of gingival cancer into the floor of the mouth or the cheek is common. Prompt recognition, immediate biopsy and roentgenograms are

8. Sharp, G. S., and Spickerman, H. D., Cancer of the Tongue. *Am. J. Roentgenol.* 57:181 (Feb.) 1947.

required in all instances in order to ascertain whether, and to what extent, invasion of the alveolar bone or true cortex has taken place.

At the onset, gingival cancer forms a small nodular outgrowth or minute ulcer; with a little secondary inflammation, early symptoms of pain and tenderness develop. Papillary lesions are elevated outgrowths with extensive spread along the surface, while concomitant invasion in depth is either entirely absent or has at least remained relatively limited. The overgrowth often forms a solid mass with a smooth surface, but ulceration will invariably take place. In other instances, papillary lesions may be described as fungating tumors which almost from the beginning show ulceration which will remain flat under a denture or become cauliflower-like in appearance if growth is unrestrained.

Figure 5, *A*, shows an extensive and invasive carcinoma of the left lower gum measuring 3.5 by 2.0 cm. The entire alveolar ridge was destroyed in the area of the lesion. The growth extended down the lingual and buccal surfaces of the body of the mandible. Cervical nodes were not palpable. A roentgenogram of the left mandible (Fig. 5, *C*) demonstrated an area of destruction 3.4 by 2.0 cm., with direct invasion of the body of the mandible. Figure 5, *B*, shows the healed scar without radiation changes following roentgen therapy for the lesion. A lymph node later developed in the left side of the neck, and was treated by implantation of radium needles because the patient was 84 years old. Dentures were constructed and worn without discomfort until his death from heart disease, at which time no evidence of cancer of the gum was demonstrated.

During their early stages, flat, ulcerous lesions may be easily mistaken for periodontal disease or simple nonspecific mucosal ulcers. When first discovered, the patient may consider the condition a root abscess; if the tooth is extracted without biopsy, the growth may progress by way of the empty alveolus to invade the bone. Ordinarily, the periosteum is resistant to tumor invasion, but the persistent use of dentures over the lesion may force this early invasion.

Invasion beyond the boundaries of the gum is inevitable as is the development of cervical node metastases. Usually, this latter complication occurs only after the primary growth has invaded the surrounding tissues. However, two patients in this series first noticed an enlarged gland in

Fig. 4.—Two simultaneous primary cancers of the left lower gum. Microscopic study of this region showed that the two were not in any way connected

the neck which caused them to seek medical aid.

Metastatic spread to regional lymph nodes apparently takes place sooner and more often from the lower (66 per cent) than from the upper gum (34 per cent).

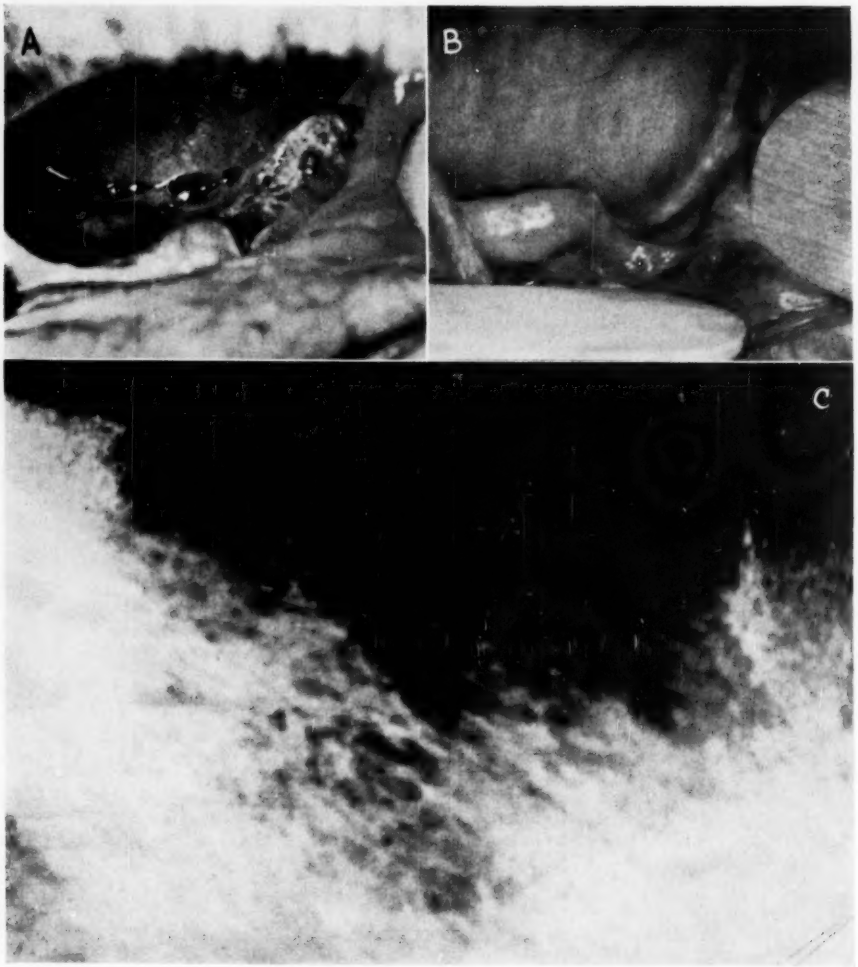

Fig. 5.—A: Extensive and invasive carcinoma of the left lower gum. B: The healed scar on the left mandible without radiation changes following roentgen therapy. C: Roentgenogram of the left mandible demonstrating the area of destruction with direct invasion of the body of the mandible

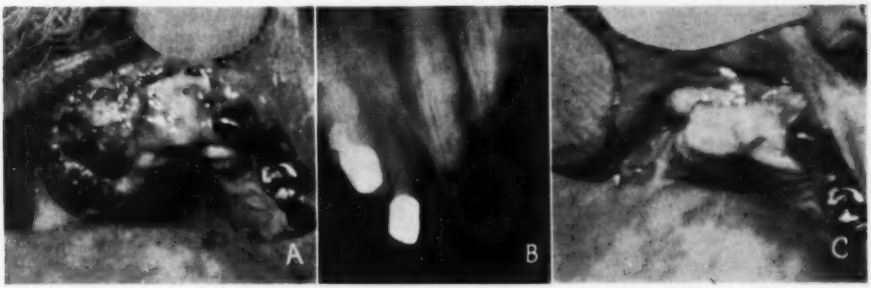

Fig. 6.—A: Papillary cancer of the right upper gum. The growth invaded the alveolar ridge, hard palate and cheek. B: Roentgenogram showing complete destruction of the alveolar ridge and the lateral half of the hard palate. C: Region after surface radium treatment and roentgen therapy

On admission, 33 per cent of the patients had metastatic nodes in the neck, microscopically-proved; subsequently 8 per cent developed positive metastatic nodes; a total of 41 per cent developed metastatic nodes from cancer of the gum. Martin[9] reported similar percentages of positive nodes on admission, 35 per cent, and the subsequent development of nodes was approximately the same percentage as in this series. The cervical metastatic spread has been mentioned, and emphasis need only be given here to stress the importance of performing a complete radical block neck dissection whenever a positive node is demonstrated, which includes all contents of all of the cervical triangles except the carotid artery and the important nerves.

■ *Treatment*

In the treatment of cancer of the gums, the choice between the various methods of surgery and irradiation, or the combination of both procedures, depends largely on the findings in each individual case, especially whether, and to what extent, invasion of bone has taken place. Owing to the close proximity of bony structures, grave problems exist whenever the cancerous process has advanced beyond the stage of a strictly superficial lesion without bone invasion. It is imperative to remove the malignant growth with a large zone of surrounding normal tissue and underlying bone, in order to afford the patient the greatest chance of survival. Yet the large dose of radiation required for destruction of the lesion may lead to radionecrosis, sequestration of bone, or an occasional sensitive thin scar which will not be adaptable for dentures. On the other hand, radical surgery may not only prove unsatisfactory from a cosmetic point of view, but at times also entails permanent loss of function. As a result, the selection of treatment can be made only after full consideration of these limitations and complications.

Figure 6, *A*, illustrates a papillary cancer of the right upper gum which meas-

9. Martin, H. E., Cancer of the Gums. (Special Monograph) *Am. J. Surg.* 54:765 (Dec.) 1941.

ured 4 by 3 by 1 cm. The growth invaded the alveolar ridge, hard palate and cheek. A roentgenogram demonstrated complete destruction of the alveolar ridge and the lateral half of the hard palate on the right (Fig. 6, *B*). The growth was treated with surface radium and roentgen therapy (Fig. 6, *C*). There was no evidence of local recurrence or cervical node metastases four years later when the patient died.

Prophylactic oral hygiene is the primary early step in the treatment, since oral sepsis may readily be cleared up, and dietary deficiencies should be adjusted, together with large doses of vitamins B and C. Teeth which are loose, infected, or associated with periodontal disease in the vicinity of the growth should be extracted if radiation is to be employed. Likewise, it is necessary occasionally to extract several teeth to permit the proper application of roentgen therapy. In any case, the removal of teeth should be done preliminary to irradiation. Extractions prior to surgery are only advisable to clear up infection.

■ *Treatment of the Primary Lesion*

Carcinoma of the upper and lower gum is usually a well-differentiated type of squamous cell carcinoma, and metastasis to regional nodes is not only frequent, but it occurs early in the course of the disease. A small growth (2.0 cm. in diameter or less) with little bone invasion may be destroyed with equal regularity by roentgen therapy or local excision. Carcinomas of larger size and with evidence of extensive invasion are best treated by partial resection or hemisection of the maxilla or mandible.

■ *Roentgen Therapy*

The advantages of roentgen therapy are obvious; for the superficial early lesion this form of therapy is ideal. External and peroral roentgen therapy may be carefully planned by using both of these portals and dividing the dose between each portal so that a total tumor dose may be delivered without excessive changes to the skin or mucous membrane, and without risk of subsequent radiation necrosis of bone. If radiation is decided upon for the treatment, the growth must be adequately exposed by tooth extractions to permit entrance of the proper cone through the dental aperture and to enable the cone to be directed for a complete exposure of the growth. In selected cases, our experience with this radiation has been successful.

■ *Surgical Treatment*

Local excision of early superficial lesions of the upper and lower gum may be performed providing the growth is limited to the gum, as previously described. The excision must extend 1.5 cm. beyond the clinical margins of the growth, and it should be between 1.0 cm. and 1.5 cm. in depth (Fig. 7). This procedure is best done under general anesthesia with thiopental sodium and intratracheal oxygen. The pharynx is packed for completely controlled anesthesia, as well as for eliminating risk of aspiration of blood. Teeth are extracted if present 1.5 cm. from the anterior and posterior borders of the growth. The mucous membrane is then cut medially and laterally this same distance from the margins, and all bleeding controlled. The alveolar ridge is divided

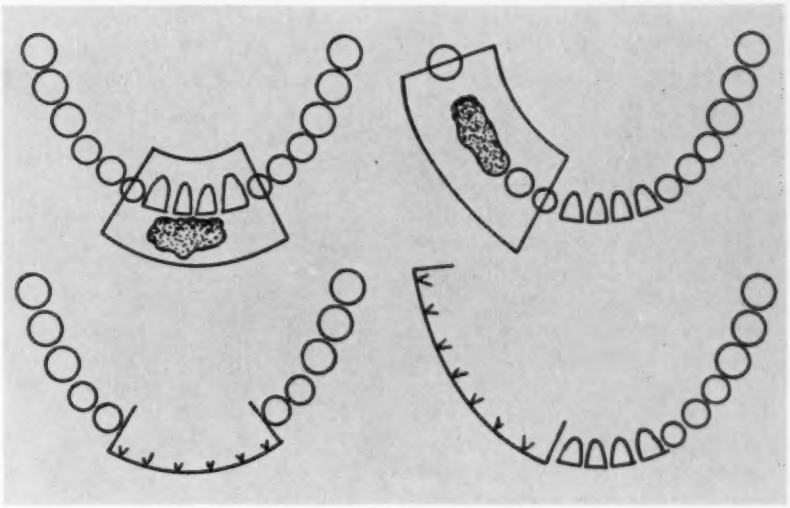

Fig. 7.—Schematic outline of a superficial growth on the gum with the area of excision and line of closure

at the measured distance by a circular motor saw. A mallet and chisel are necessary to cut the cortical plates of the body of the mandible or the anterior wall of the maxilla and hard palate. Removal of the growth, adjacent soft tissues and bone may be easily done with bone holding forceps. The margins of the mucous membrane may then be freed further by blunt dissection, if necessary, to permit a primary closure.[10] This limited oral excision is extremely dangerous, since a local recurrence following such a procedure is often fatal.

HEMISECTION OF THE MANDIBLE—Oral hemisection of the mandible may be performed rarely for more extensive cancers of the gum if the cervical nodes are not involved.[11] This procedure may be used for verrucous types of carcinoma of the gum, which rarely if ever metastasize, or for malignant tumors of the jaw in cases where the cortical plates have not been destroyed. The preparation and anesthetic previously described are used. A point is selected on the gum 1.5 cm. anterior to the margin of the growth. If this point is posterior to the insertion of the digastric muscle to the body of the mandible, the patient will have a relatively normal function. The mucous membrane is then incised 1.5 cm. on all sides of the growth; the cut surfaces are separated somewhat by blunt dissection and the soft tissues are completely separated from the body of the mandible on both surfaces at the selected point of resec-

10. Gorney, H. S., Gorney, A. J., and Fomon, S., Creation of Mandibular Ridge by Deepening Labial Sulcus and Lining It With Skin Graft. *J.A.D.A.* 29:751 (May) 1942.

11. Johnson, G. S., and Daniel, R. A., Jr., Carcinoma of the Gum. *Ann. Surg.* 117:74 (Jan.) 1943.

tion. A stab wound is made through the skin below the mandible at this point, and a Gigli's saw is drawn through the incision and the floor of the mouth. The mandible is then divided, and the bone is grasped with bone holding forceps. Beginning at the symphysis or at the point of division of the mandible, the soft tissues, including the depressor labii inferioris, depressor anguli oris, the buccinator and the masseter muscles, are detached from the lateral surface of the bone with a periosteal elevator. The divided end of the bone is drawn anteriorally, the mylohyoid muscle is divided, care being taken to avoid injuring the sublingual and submaxillary gland or the lingual nerve unless it is necessary. Next, the internal pterygoid muscle is detached from the bone with the periosteal elevator, and the temporomandibular ligament of the mandible and the inferior dental vessels and nerve are divided. The mandible is then depressed so that the coronoid process may be brought into view. When the temporal muscle is divided with curved scissors, the tendon of the external pterygoid muscle becomes visible and is divided with scissors or is separated with a periosteal elevator. The stylomandibular ligament is separated posteriorly from the bone, leaving only the capsular ligament to be divided with curved scissors. Bleeding is readily stopped and the wound is closed with mattress sutures. The stab incision in the skin is adequate for drainage.

EXTERNAL PARTIAL RESECTION OF THE MANDIBLE—A carcinoma of the gum in the bicuspid and first molar area with roentgenographic evidence of invasion into cortical bone may be treated advantageously by a partial resection of the body of the mandible and a subsequent bone graft to attain normal function (Fig. 8). This procedure is usually performed in two stages. Using the preparation and anesthetic previously described, an incision is carried from the submental process just below and parallel with the body of the mandible to the angle. The superficial fascia and platysma are then divided. It is well at this point to palpate carefully the regional nodes. Any questionable ones should be immediately sent to the laboratory for frozen section and microscopic examination, and if positive, the operative procedure must include a radical neck dissection.

The facial artery is tied. Great care should be taken to avoid the parotid and submaxillary glands. A point is selected 1.5 cm. anterior to the margin of the growth on the gum for the division of the mandible. A similar point is selected the same distance posterior to the limits of the growth. The two points are then joined by incisions medially and laterally, keeping in mind the same margin of safety. The soft tissues are separated from the bone surfaces with a blunt instrument or periosteal elevator. Whenever possible, it is desirable to maintain the attachment of the digastric muscle. The mandible is divided anteriorly at the point of selection with a Gigli saw. The bony specimen is grasped with the bone holding forceps and held firmly while the mandible is divided posteriorly at the point of selection. This may be done with a Gigli's saw; or, if an angulation is required in order to preserve a portion of the angle of the mandible, a bone cutting rongeur is used. The specimen is removed, and the

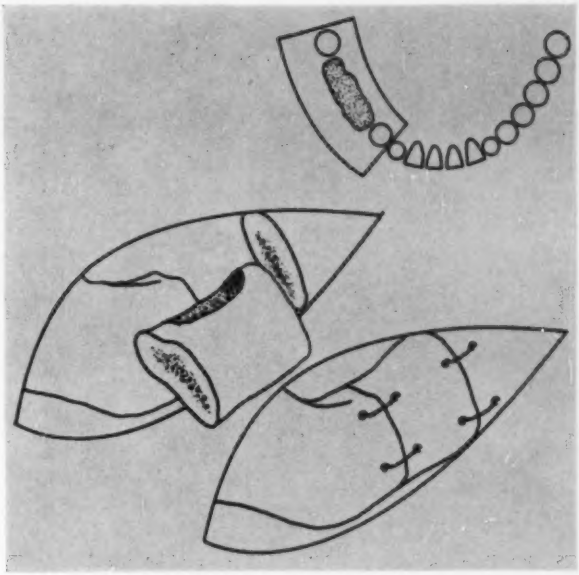

Fig. 8.—Schematic outline of a segmental jaw section with replacement of the defect with a bone graft from the crest of the ileum

mucous membrane is closed with interrupted mattress sutures.

A Roger-Anderson external splint is applied with bone nails anteriorly, and either the bone nails or the special Thoma mandibular bone clamp posteriorly. Closure of the platysma muscle is made with continuous plain catgut, and the skin is closed with continuous dermal sutures. One drain is inserted. The external fixation splint is then applied so that the jaws meet in normal occlusion. Complete healing usually takes place within two weeks, but it is desirable to delay the second procedure for six weeks.

At the second stage, and using the same preparation, the external fixation bars are removed from the Roger-Anderson nails, the previous scar is removed, and the tissues are divided sufficiently to permit the placement of a bone graft, but without entering the oral cavity. The anterior and posterior ends of the mandible are exposed for a distance of 1 cm. An exact measurement is then taken in normal position. A second complete surgical setup is required, and a second operator makes an incision over the crest of the ilium. It is exposed medially and laterally downward for a distance of 2 cm. without damage to the periosteum. The measurement is marked on the ilium. At these two points, incisions are made with a circular motor saw for a depth of 1.0 to 2.0 cm. This section of bone is removed with the mallet and chisel. It is then handed to the first operator, who adjusts the ends to as close an approximation as possible by means of a rongeur. Two small holes are drilled in each end of the mandible and

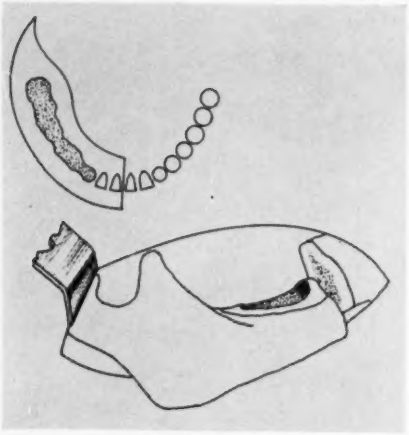

Fig. 9.—Schematic outline of a hemisection of the mandible with or without radical neck dissection

in each end of the bone graft to permit entrance of 26 gage steel wire. The wires are then threaded and tightened so that they are snug, but not tight enough to cause a pressure destruction. Several small fragments of cancellous bone may well be placed around the ends of the graft. Closure of the incision is made by interrupted mattress sutures, and a drain is usually necessary for 24 hours. Caution is obviously necessary to keep the two surgical units separate to avoid any contamination in the donor wound.

EXTERNAL HEMISECTION WITH PARTIAL OR TOTAL RADICAL NECK DISSECTION —This surgical procedure is required whenever the primary growth has invaded beyond the boundaries of the gum and when a palpable cervical node is considered clinically metastatic (Fig. 9). Formerly, this radical procedure was accompanied by a rather high operative mortality rate; but with the recent progress in anesthesia, control of shock and of postoperative infections operative mortality is minimal. The cosmetic result following this mutilative operation is surprisingly satisfactory, and the improvements in surgical prosthesis offer the patient a satisfactory function.

The surgical procedure is performed in one stage, with the preparations and anesthetic previously described. The patient is placed on his back, with the shoulders raised and the neck extended. The standard incisions are made; the main one from the tip of the mastoid to the sternal notch, a second one from the mental process backwards to the main incision and a third one from the main incision posteriorly over the supraclavicular fossa. All incisions are carried through the superficial fascia and platysma. The skin flaps are reflected peripherally to the boundaries of the neck. The aim of this dissection is to remove all of the superficial cervical chain of lymph vessels and lymph glands, which are numerous along the course of the external and posterior jugular veins. Even more important are the deep cervical glands, which number 20 to 40, along the internal jugular and subclavian veins. The dissection is begun at the lateral apex of the supraclavicular fossa and carried medially. All contents, including the omohyoid and the sternocleidomastoid muscles, are removed, with the exception of the phrenic nerve. After identifying the vagus nerve, the internal jugular vein is ligated and divided above the clavicle, and the dissection is carried up through the inferior carotid triangle and the posterior cervical triangle to the

level of the digastric muscle. The greatest care must be taken to remove all of the structures around the carotid artery. Usually at this point a dissection of both submental triangles is begun, since the lymphatic anastomosis in this area is so intricate that it is best to go past the midline and to include the opposite submental triangle.

When the site of division of the mandible is exposed, a Gigli's saw is inserted through the floor of the mouth and the mandible is divided. If the growth does not involve the buccogingival groove and tissues of the cheek, it is best to preserve the lip without dividing it. However, if these tissues are involved, it is best to make an incision vertically down through the midline of the lower lip or vertically down from the commissure of the lips, as the case may demand, so that the cheek flap may be retracted laterally and the excision may be complete without question. The incision is carried posteriorly along the floor of the mouth for a wide margin of safety back to the ascending ramus. The dissection is readily carried posteriorly through the submaxillary triangle to the carotid sheath. The masseter and pterygoid muscles are separated from the ascending ramus with a periosteal elevator. The stylomandibular and sphenomandibular ligaments are divided with curved scissors, and the fibrous capsule of the mandibular joint is likewise readily divided. As the dissection is then carried up through the carotid triangle to the tip of the mastoid, the sternocleidomastoid muscle is divided and the internal jugular vein is readily exposed and ligated at this point. The oral wound is closed by suturing the floor of the mouth and the mucous membrane of the cheek with interrupted mattress sutures of nonabsorbable material. Care is taken not to include the opening of Stensen's duct. The lip is repaired if it was divided. The neck is closed by continuous plain

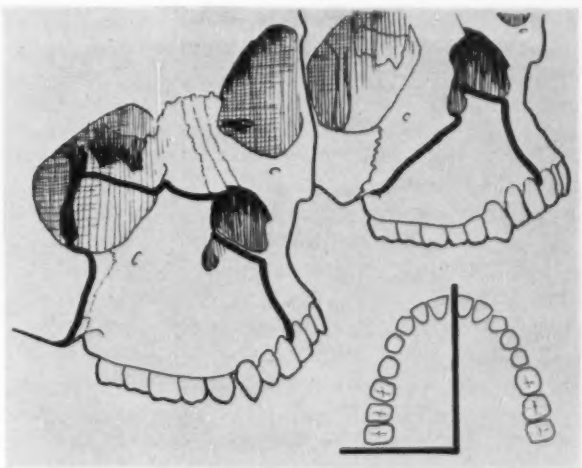

Fig. 10.—Schematic outline of the limited and radical resection of the maxilla

catgut for the superficial fascia and platysma muscle, and the skin with continuous suture. If a bone graft is not contemplated, it is wise to remove the entire half of the mandible, since the ascending ramus will be bothersome when it retracts upward and medially. The cosmetic result from this procedure is satisfactory, and even the facial defect is usually not great.

EXCISION OF THE MAXILLA—Carcinoma of the maxillary gum, in our experience, is recognized late, and the primary lesions are larger than those on the inferior gum. For this reason, only one local resection was possible. The others have required a partial or complete removal of the maxilla. In excising the maxilla, several anatomic facts are to be remembered. The maxilla is in reality a shell of bone which envelops the maxillary sinus, forms a large part of the floor of the orbit, the roof of the mouth, the lateral wall of the nasal fossa, the anterior wall of the sphenomaxillary fossa, the pterygomaxillary region and the bony front of the face below the infraorbital ridge. Its strongest portions are the malar, alveolar and palatine processes. In the excision of the maxillary bone, the inferior turbinate, part of the malar bone, part of the palatine bone and the maxillary bone, up to the nasal processes, are removed (Fig. 10). If the disease is confined to the alveolar ridge, hard palate and floor of the maxillary sinus, it is possible to perform the removal without including the floor of the orbit. However, with tumor tissue present in the maxillary sinus, it is best to remove the floor of the orbit and exenterate all contents of the orbit (Fig. 11).

The same preparation and anesthetic are employed as described previously, except that it is well to place a posterior nasal pack to prevent unnecessary bleeding into the airway. The skin incision is begun slightly less than 1.5 cm. below the medial canthus. It is carried downward along the groove between the nose and the cheek, around the ala of the nose, below the base of the nose to the midline and through the median line of the upper lip. This incision divides the skin and the superficial fascia, some of the muscles of expression, the angular artery and vein, the lateral nasal artery, the artery of the nasal septum, the superior coronary artery and the branches of the infraorbital and facial nerves. In extensive carcinomas it may be necessary to make a second incision from the point where the first began and carry it laterally along the infraorbital margin. This is to be avoided whenever possible. The cheek flap is then elevated by blunt dissection and the infraorbital vessels and nerve are ligated.

An incision in the midline in the labiogingival groove is carried laterally for the margin of safety back to the maxillary tuberosity. This incision is best done with the Bovi cutting knife. Bleeding may be controlled by desiccation. An incision is carried directly along the midline of the hard palate to the posterior extremity. If teeth are present, the central incisor is removed. The incision may then take a right-angle turn to meet the lateral incision posterior to the tuberosity of the maxilla.

With the mallet and chisel the maxilla is divided through the alveolar ridge anteriorly, and the hard palate is readily divided in the same manner. The hard

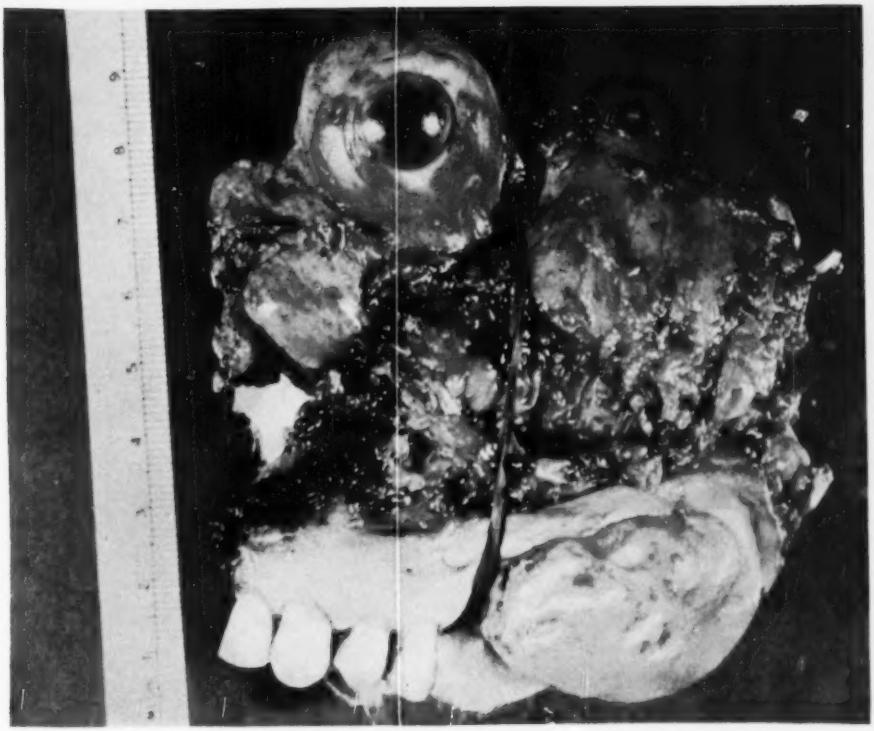

Fig. 11.—Gross specimen of a cancer of the gum which infiltrated the antrum and orbit. The entire maxilla and contents of the orbit were removed in one block section

palate may be divided close to the nasal septum, and the maxilla may be divided from the lateral nasal wall with the rongeur. If the disease is limited to the lower portion, it is best to divide the anterior surface of the maxilla just below the inferior margin of the orbit lateral to the zygoma. If extensive disease is present in the maxillary sinus or pterygomaxillary fossa, it is best to continue the resection up along the lateral border of the nose, crossing the maxilla at the inferior margin of the nasal bones through the infraorbital ridge. The zygoma may be divided in its midportion to permit a block removal, including the floor of the orbit and the entire maxilla. It is then possible with bone holding forceps to grasp the infraorbital ridge and the alveolar process, or even the tuberosity of the maxilla, and loosen the entire bone and contents of the orbit in one mass. This procedure fractures the vertical plate of the palatine bone and detaches the maxilla from the pterygoid process of the sphenoid bone.

The cavity is packed immediately to

check hemorrhage, while the removed specimen is inspected. The larger vessels are clamped and coagulated with the electrosurgical unit and the cavity is packed with a strip of iodoform gauze to control bleeding. The skin and mucous membrane of the lip are then closed. In our experience, it has been of very little advantage to ligate the external carotid artery, and a postoperative hemorrhage has not been observed.

■ *Prognosis*

More favorable results may be expected from cancer of the gums than from lesions on other oral surfaces. Evidence of this is shown from our five-year end results, but even greater encouragement is shown in our more recent cases. Martin[9] in 1941 wrote the first complete description and summary of his results.

The histopathology as to grading of the 27 squamous carcinomas showed equal division between grade I and II. The 3 adenocarcinomas were secondary or metastatic foci from primary cancer of the breast[2] and fundus of the uterus.[3] These patients died of their primary disease, but the gum lesions were completely controlled by roentgen therapy. An adenocarcinoma of the gum should always be considered metastatic until proved otherwise.

The size of the primary growth and the invasive character of the growth are significant. Of the cases cured, 2 had primary lesions of 4.0 cm. in their greatest diameter, 1 was 3.0 cm., and 5 were 2.0 cm. or less.

Cervical node involvement on admission is a serious prognostic sign. Only 1 case was cured following radical neck dissection.

The method of treatment has changed since 1932. Among the five-year survival cases, 4 were treated by radiation, 3 by local resection, and 1 by a combined resection of the jaw and radical neck dissection. The 2 cases with primary growths of 4.0 cm. or greater were treated by radiation. The more recent cases show considerable promise by block resection of the primary growth and cervical nodes in one continuous mass of tissue.

The end results of the 30 cases followed over five years show that 36 per cent of the cases are well and free from disease. Of these 8 cases observed, 3 were followed five and six years, 3 were followed 8 to 14 years, and 2 died of heart disease after three years. The latter 2 cases were followed and examined carefully until their death. The 3 cases with metastatic lesions in the gums are not included in this group, since they were under observation after 1945.

■ *Conclusions*

1. Because of the anatomic structures, cancer of the gum differs from other oral cancers in that invasion of the alveolar ridge occurs at an early stage.

2. The accuracy of diagnosis varies directly with the index of suspicion, and cancer must be looked for in all gingival lesions. Early biopsy with conclusive microscopic evidence is necessary if the percentage of cures is to be improved.

3. Dental prophylaxis and oral cleanliness with denture adjustment may prevent the development of cancer.

4. Small primary lesions may be treated either by irradiation or limited intraoral surgical procedures.

5. Large primary lesions should be

treated by radical operative procedures with an accompanying neck dissection when cervical nodes are involved.

6. Whenever possible, mandibular defects should be repaired by bone graft to restore function.

7. The prognosis is increasingly more favorable with the improvement of chemotherapeutic agents, anesthesia and block resections, with or without bone graft.

8. The end result of the five-year group showed 36 per cent of the unselected cases to be well and free of disease. —635 *Herkimer Street.*

Respiratory and cardiac stimulants and resuscitation

■ *Lloyd C. England, D.M.D., Providence, R. I.*

Anyone who administers a general anesthetic in his office cannot do so without a certain amount of risk. Most dental anesthesias are of short duration and in the first plane of the third stage; therefore, it is seldom that a respiratory or cardiac stimulant is necessary. However, there is always the possibility of an emergency and it is necessary to have available for immediate use an emergency kit containing three or four effective respiratory and cardiac stimulants with a sterile syringe.

The purpose of this paper is to discuss some of the methods and drugs available for use in case of such an emergency. It is the desire of the dental profession that general anesthetics be used in the dental office with extreme caution lest the privilege of using them be limited or withdrawn by law as was done in Canada and in Great Britain. Mortality rates from nitrous oxide-oxygen reported in the literature vary greatly from one death in 20,000 cases, reported in a study by Webster,[1] up to one death in 2,814 reported by other authors. It is a notable fact that they are the subject of widespread comment by the press when they do occur.

It is a fortunate thing that in most cases of respiratory arrest the heart continues to beat for about two minutes. During that time some practical method of artificial respiration should be administered. One of the greatest safety devices to use in such a situation is the emergency oxygen valve. An excellent technic of inflating the lungs with oxygen is described by Clement.[2]

1. Close the exhaling valve on the nosepiece.

Read at a meeting of the oral surgery staff of the Boston City Hospital, Boston, Mass.

1. Webster, William, *Science and Art of Anesthesia.* St. Louis: C. V. Mosby Company, 1924.

2. Clement, F. W., *Nitrous Oxide-Oxygen Anesthesia,* ed 2. Philadelphia: Lea & Febiger, 1945.

2. Apply the nosepiece tightly to the patient's face, at the same time elevate the chin to insure an open airway.

3. With the thumb of the left hand exert a steady, gradually increasing pressure on the direct oxygen button.

4. Watch carefully to see that the chest expands, evidence that the oxygen is entering the lungs.

5. When the chest is expanded, open the exhaling valve to allow deflation from the elastic recoil of the lung tissue.

6. Repeat as necessary. An open airway must be maintained.

All practitioners should be familiar with the methods of manual resuscitation, pressing on the chest of the patient or turning him over and pressing on the lower ribs, as in the Schaefer method. Detailed studies of deaths under general anesthesia have been made and it was found that the most glaring deficiencies were in resuscitation. In some of the cases considered various drugs were injected directly into the heart, while some form of injection was used as a primary measure in others. Oxygen inflations were used early in only a few instances and in only a very few cases was manual artificial respiration instituted. Thus in most cases faulty resuscitative measures were used. (Two of the above cases studied were tooth extractions under nitrous oxide.)

Waters and Gillespie,[3] in their report on deaths in anesthesia, have been severely criticized for their casual reference to "the usual resuscitative measures," for nowhere do they describe what these usual measures are or should be. The method of artificial respiration is of real importance. There are more wrong than right ways to resuscitate, and any anesthetist before he anesthetizes his patient should first of all be sure he is familiar with two acceptable methods of reviving him.

A trained anesthetist keeps his patient well under control as the anesthesia progresses through the different stages. He knows the signs and symptoms and knows at a glance whether the anesthesia is light or deep, whether the patient's breathing is free and easy or if there is an obstruction in the airway. Therefore, if an accident happens, he will know immediately and the steps he will take thereafter will be governed by what he believes is the cause. For example, an anesthetist would not administer carbon dioxide to a patient when he is quite sure that an obstruction in the airway has caused the respirations to cease. He will be well aware of the fact that the patient's blood already has an excess of carbon dioxide and he will endeavor to open the airway and oxygenate the lungs at once.

■ *Respiratory Stimulants*

Nikethamide (Coramine) is a pyridine derivative which is water-soluble and which was introduced into therapeutics both as a respiratory and a cardiac stimulant. It is effective in doses which have little action on other portions of the cerebrospinal axis and it acts more effectively on a depressed than on a normal respiratory center. It acts more rapidly when administered by the intravenous method. However, the use of nikethamide in cardiac failure has been disappointing

3. Waters, R. N., and Gillespie, N. A., Deaths in the Operating Room. *Anesthesiology* 5:113 (March) 1944.

and its use is now confined primarily to acute nervous system depression. It is available in sterile ampules for parenteral administration. The dose is 1 to 3 cc.

Pentamethylenetetrazol (Metrazol) is a synthetic compound which also possesses to a high degree the property of stimulating the central nervous system. Respiration is greatly increased by large doses. The vasomotor and vagal centers of the medulla are likewise stimulated. It is a relatively nontoxic drug insofar as the amount necessary to produce serious poisoning is concerned. It is absorbed very rapidly from all sites of administration and it is rapidly detoxicated, probably by the liver. Pentamethylenetetrazol is a white crystalline powder soluble in water and is available in sterile ampules containing 1 or 3 cc. This drug has also been widely used to produce convulsions in the treatment of schizophrenic patients.

Caffeine is one of the group of drugs which are known as xanthine derivatives. Other xanthine derivatives are theophylline and theobromine. Caffeine is the most powerful sulfocyanate stimulant of the three. It excites all portions of the central nervous system. The main sites of stimulation are the cortex, medulla and spinal cord. The cortex is first affected, next the medulla; the spinal cord is stimulated only by very large amounts. Caffeine is a weakly basic alkaloid. It is usually dispensed in the form of a soluble double salt which it forms with a number of compounds. For oral administration either the free base or the double salts may be used, but for parenteral administration it is necessary to employ one of the soluble salts. Two widely employed soluble salts are citrated caffeine, and a mixture of caffeine with sodium benzoate. For hypodermic administration the benzoate salt should be used. The usual therapeutic dose of caffeine is 2 cc. or 7½ grains intramuscularly.

Atropine, which is considered a mild respiratory stimulant, is an alkaloid of the belladonna plant. The deadly nightshade is the main source of the drug. Atropine is now synthesized but the synthetic product does not possess the wide range of therapeutic usefulness which characterizes the naturally occurring product.

Atropine produces stimulation of the medulla and higher cerebral centers. In usual clinical doses this effect is manifested only by some moderate respiratory stimulation. This is probably due to a direct action of atropine on the respiratory center. The rate and occasionally the depth of breathing are increased. However, when respiration is seriously depressed, atropine cannot be depended upon to produce stimulation. In fact, under such circumstances, large or continued doses of atropine may cause even further depression of breathing. The main usefulness of the drug in the field of anesthesia is a premedicant, especially where a surgical procedure is to be performed in the mouth or throat. When a therapeutic dose is given it inhibits glandular secretions of the nose, pharynx and bronchi, and thus causes drying of the mucous membranes of the respiratory tract. The smooth muscles of the bronchi and bronchioles are relaxed which results in a slight widening of the airway and an increase in the volume of residual air.

Strychnine is a valuable respiratory stimulant only when the central nervous system is depressed to a degree which al-

lows effective doses to be given with safety. Consequently, it is useful in the treatment of poisoning by the central nervous system depressants rather than a stimulant to be administered for resuscitation. To the drug have been ascribed properties which it does not possess or which it exhibits only when administered in toxic doses. Pharmacologic studies have shown that many of the therapeutic applications of strychnine have little or no rationale; yet, like alcohol, the drug has a background of long usage and it continues to enjoy unwarranted popularity.

The importance of digitalis as a cardiac stimulant makes it impossible to omit it from this list, even in a paper of this brevity. Digitalis or foxglove was mentioned in 1250 in the writings of Welsh physicians. It was described botanically 300 years later by Fuchsius who gave it the name of "digitalis purpurea" because the flower was purple and resembled a finger. Foxglove was occasionally used internally or locally for a number of unrelated diseases ranging from epilepsy to skin ulcers. The seeds and leaves of a number of other digitalis species also contain active cardiac principles. The clinical value of many of them has not yet been fully established.

For many years digitalis was looked upon as influencing the heart mainly through the slowing of cardiac rate which occurred under certain circumstances. This was due to the fact that digitalis was thought to be specific in the treatment of auricular fibrillation in which it often dramatically slows the ventricular rate. The slowing in rate was believed to be the basis for relief of symptoms. In this manner the primary action of digitalis on the heart muscle was minimized or ignored and the drug was not recommended for heart failure with normal rhythm, but rather reserved for arrhythmia with rapid heart rate. It finally became firmly established, however, that digitalis was chiefly effective in congestive heart failure, regardless of cardiac rhythm, and that it brought relief not by virtue of slowing but rather by its direct action to increase the force of the myocardial contraction. When parenteral digitalis is necessary the intravenous route is selected. This is only warranted when minutes rather than hours may spell the difference between life and death. Patients requiring intravenous digitalis are, therefore, moribund, and emergency measures such as forced oxygen, artificial respiration and heart massage have failed to establish improvement. The preparations used are water-soluble, purified digitalis fractions. The dose must be carefully calculated according to the patient and the injection must be made very slowly.

Epinephrine, the active principle of the adrenal medulla, was the first hormone to be isolated in crystalline form. Curiously, epinephrine is also found, along with substances resembling cardiac glycosides, in the secretions of glands of toads. The parotid glands of a single Jamaican toad (*Bufo marinus*) contain more than four times the amount of hormone present in a pair of human suprarenal glands. The derivatives of epinephrine which are employed in therapeutics represent only a small proportion of the more than 200 compounds which have been synthesized and studied. Epinephrine is too often looked upon as

an effective agent in reviving patients apparently dead in anesthetic accidents. While it is true that the drug occasionally produces dramatic results, much more often it fails entirely. This is due either to the fact that the arrested heart is beyond resuscitation or to the precipitation of ventricular fibrillation by the large doses of epinephrine administered intravenously or intracardially. If heart sounds are still audible, small doses of epinephrine (0.05 to 0.2 cc. of a 1:1,000 solution) may be diluted and injected very slowly intravenously. If heart sounds are unobtainable, intracardiac injections of 0.5 cc. may be performed by inserting a long needle of fine gage through the fourth intercostal space close to the sternum. When death is imminent, heroic measures are justified despite the potential risk of ventricular fibrillation. If asystole occurs during the early phase of inhalation anesthesia it is quite likely that ventricular fibrillation already exists and little benefit can then be expected from injecting epinephrine. Cardiac massage, artificial respiration and other emergency measures mentioned above should be employed not only before but during and after the injection of a stimulant. Colokathis[4] described two cases of complete respiratory failure which were revived only through heroic efforts, artificial respiration, forced oxygen and the injection of nikethamide. All necessary measures were taken immediately after respiratory arrest was noted.

■ *Summary and Conclusion*

1. The dentist who administers a general anesthetic in his office should have an emergency kit in the same room where the anesthetic is being administered.

2. Early measures taken at the first signs of respiratory arrest are by far the most important and have the greatest chance of success.

3. Quick action is necessary. During a period of from one to two minutes, if forced oxygen and artificial respiration do not revive the patient, the emergency kit must be in readiness for more drastic action.

4. Pentamethylenetetrazol and caffeine sodium benzoate are two strong allies. They are cardiac and respiratory stimulants and are very effective if injected promptly by the intravenous method. Nikethamide has long been used as a cardiac stimulant, but it is used now mostly as a stimulant for the nervous system in acute depression.

5. Atropine is used to better advantage preoperatively to reduce mucous secretions and is, therefore, an "ounce of prevention."

6. There are a few other stimulants known, such as strychnine and digitalis, but it is wiser for the dentist to familiarize himself with three or four effective resuscitants and be sure he knows how to use them to best advantage in an emergency.

7. General anesthesia serves a very important need in many dental offices and clinics. Every effort should be made to see that it does not fall into disrepute.—*171 Westminster Street.*

4. Colokathis, Louis, *Lectures in General Anesthesia to Dentists*. Boston City Hospital, November, 1948.

Mixed tumors of the palate

■ *Adolph Berger, D.D.S., New York*

Mixed tumors of the palate are comparatively rare. Eggers,[1] reporting 5 original cases in 1928, stated that after a thorough search of the literature extant he found only 100 cases previously reported. The present contribution is based upon 12 cases from my experience.

The origin of mixed tumors of the palate, like the histogenesis of mixed tumors in general, is obscure. Most investigators maintain that they result from embryonic displacement, though there are various theories as to the manner and time.[1] Others[2] have advanced the opinion that, not unlike mixed tumors of the parotid gland, mixed tumors of the palate and cheek are derived from aberrant basal cells of the primitive buccal epithelium. The histology of mixed tumors of the palate lends force to the theory of their origin from aberrant embryonic cells. It is reasonable to assume that the displacement occurs during fetal life and that it does not always result in neoplastic developments. Here too as elsewhere there can only be speculation about the specific factors which lead to neoplastic developments.

■ *Clinical Considerations*

The photographs of the cases presented here show that the growths in question vary in size at the time of discovery from that of a lima bean to that of a pigeon's egg. They are superficially or fairly deeply lodged within the adjacent tissues. The extent of their penetration cannot always be estimated from clinical appearances.

Their temporal duration cannot be determined, since the patients' observations are uncertain and not reliable in this respect. As there are no early disturbing symptoms, most patients were unaware of the growth even when it attained considerable size. In several instances the growth was discovered by chance in oral examination. One patient noticed a large growth by passing a finger over it just a few days before she was seen.

Pain or discomfort was present in some cases, however, as a result of surface ulceration or irritation caused by the pressure of a denture. In one case it was noticed when a well-fitting denture was being dislodged by the increasing growth.

The covering mucous membrane may be normal, or, on the other hand, thinned, glossy and discolored. In some cases the thinned-out mucous membrane was inflamed or ulcerated, and the irritation from food caused pain or discomfort. In one case, the ulceration penetrated deeply into the neoplasm proper.

Upon palpation the growths are found

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Consultants were Arthur Purdy Stout, Professor of Surgery (Pathology), Columbia University, New York, and Henry L. Jaffe, Director of Laboratories and Pathologist of the Hospital for Joint Diseases, New York.

1. Eggers, H. E., Mixed Tumors of the Palate. *Arch. Path.* 6:378 (Sept.) 1928.

2. Stein, Irvin, and Geschickter, C. F., Tumors of the Parotid Gland. *Arch. Surg.* 28:492 (March) 1934.

to vary in consistency, some being almost fluctuant while others are of a soft rubbery consistency. They are somewhat movable although firmly attached to the underlying periosteum.

ROENTGENOGRAPHIC EXAMINATION—Roentgenograms were taken in every case routinely. Dental and larger intraoral roentgenograms are of little diagnostic value as they are obscured by the overlapping of the outer plate of the maxilla and the alveolar bone. None of the growths here reported was destructive to the underlying bone. In every case, the bone upon which the growth rested was more or less depressed, but in none was the bone deeply eroded or perforated.

The larger anteroposterior and lateral roentgenograms are of value in differential diagnosis. Malignant growths in these localities, sarcomas especially, of similar duration and appearance are often widely destructive and not infrequently invade the maxillary sinus.

CLINICAL OBSERVATIONS—As New[3] points out, a correct clinical diagnosis is not difficult to make in these cases. This may be true for persons who have had some experience in their diagnosis. However, these growths may be mistaken for dental subperiosteal abscesses, odontogenic cysts and torus palatinus. When mistaken for a subperiosteal abscess, they were incised for drainage. An abscess, however, can easily be distinguished because of its characteristic history of preliminary pain, the presence of defective and infected teeth, by pressure tenderness and fluctuation, and by systemic reactions such as chills, fever and leukocytosis. If no early surgical intervention is resorted to, spontaneous rupture may occur in connection with an abscess.

Odontogenic cysts tend to distend the bone by slow pressure resorption but they are rarely lodged upon the bone surface as are mixed tumors.

The torus palatinus is distinctly a bony excrescence and is almost invariably located in the middle of the palate.

■ *Pathology*

Some of the mixed tumors of the palate are completely encapsulated, while in others the encapsulation is incomplete, in which case it is the anterior part that is encapsulated. In general, the posterior or distal portion merges into the soft palate and the pillars of the fauces. The degree of encapsulation is generally only discernible on surgical exposure of the tumor.

The encapsulated growths were removed completely. When there was doubt about the nature of the growth, especially when it was not clearly encapsulated, a biopsy was done before the lesion was completely extirpated.

The cellular elements of these growths do not conform to a uniform pattern and present considerable histologic variations. Some of the tumors consist predominantly of undifferentiated cells held together by a sparse connective tissue stroma suggesting possible malignant tendencies; others are clearly benign, and still others exhibit glandular acini and other individual characteristics. Eggers[4] showed that in his cases the lesions also contained a great diversity of epithelial

3. New, G. B., Mixed Tumors of the Throat, Mouth and Face. *J.A.M.A.* 75:732 (Sept.) 1920.

developments. Some specimens showed all the features ordinarily associated with malignant growths. He emphasized, however, that from a morphologic point of view many of these palatal tumors would be adjudged as malignant, but from a clinical point of view almost none.

It is desirable, therefore, that both the surgeon and the pathologist should be familiar with the clinical appearance and the variable histologic components of these growths, and that treatment should be based upon a coordinate clinical and pathologic diagnosis. Pathologic interpretation alone is prone to lead to unnecessarily extensive and mutilating operations.

■ *Treatment*

For surgical expediency it is desirable to distinguish between the completely encapsulated growths. The enucleation of the first type offers little surgical difficulty. The removal of incompletely encapsulated lesions presents a greater problem, since that portion of the growth which merges into the soft palate and into the pillars of the fauces must be visually traced. With careful inspection, however, a line of cleavage and a distinctive texture of the normal and neoplastic tissues can be grossly discerned.

The following operative procedure was routinely employed in the cases treated. Preoperative sedation was administered. All cases were operated on under block and infiltration anesthesia. The blocking was done by the tuberosity injection high in the sphenomaxillary fossa to reach the descending palatine nerves where they issue from Meckel's ganglion. Where the growth could be cleared, further blocking was done through the posterior palatine foramen. The blocking was supplemented with infiltration beneath the growth next to the periosteum and, to aid dissection, underneath the mucous membrane at its uppermost surface without penetration of the neoplasm proper.

As a preliminary step, one or two ligatures were passed about the tissues, beyond the apparent posterior termination of the growth. These parts are richly supplied by the palatine vessels and when these are compressed the bleeding is controlled. The ligatures of number 2 chromic catgut or the medium dermal tension suture were left in position for 48 hours or even longer to prevent secondary hemorrhage.

A lineal incision was made anteroposteriorly, somewhat beyond the termination of the growth and over the middle of its crest. The sharp incision penetrated only the mucous membrane and from there the growth was separated mainly by blunt dissection. Bleeding vessels were ligated or clamped, and the wound was closed with interrupted sutures for primary union.

Larger tumors leave a considerable dead space. A wick of iodoform gauze may be introduced at the anterior pole of the wound, and the detached mucoperiosteum may be gently pressed against the bone surface. In most cases the wound closed by first intention. In some, however, though the wound had been accurately coaptated, some sloughing along the edges of the wound occurred. In no case was there postoperative infection. Neither thermal nor chemical cauterization was used in the removal of these growths. The underlying bone was not curetted and was left intact.

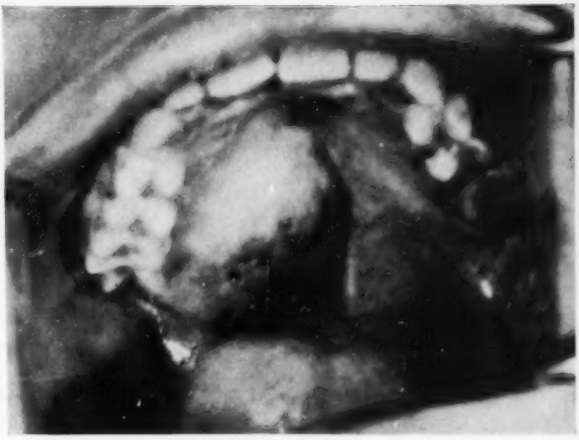

Fig. 1.—(Case 1) Mixed tumor of the palate. Duration of the growth about six years

CASE 1—The patient, a boy of 13, was first seen in November 1932. He complained of a swelling which covered a large portion of the right side of the hard and soft palate (Fig. 1). The swelling was noted approximately six years earlier, when he fell with a lollypop in his mouth and the stick of the lollypop injured his palate. Some bleeding followed and a physician was consulted. He lanced the swelling under the impression that it was an abscess. The mother stated that no pus was found. During the following four years, the swelling was incised on two other occasions, by a dentist and a surgeon, both likewise interpreting it as an abscess. More recently, the swelling appeared to increase in size, and attention was sought for this reason.

The involved area showed scars of former incisions but the covering mucous membrane was not remarkable. The lesion was firmly adherent to the surrounding tissues and to the periosteum. The posterior portion seemed to merge into the soft palate and into the anterior pillars of the fauces. Upon palpation, the growth was compressible but not fluctuant and suggested the consistency of a soft rubber ball. There was neither clinical nor roentgenographic evidence of destruction of the underlying bony tissue.

The growth was removed on December 16, 1932. The pathologic report was mixed tumor of the palate (Fig. 2). The wound healed uneventfully, and the patient was dismissed after 14 days. The patient was seen periodically for four years. There was no recurrence during this interval.

CASE 2—The patient, a woman of 72, was first seen in May 1940. The growth was discovered during an oral examination preparatory to constructing dental restorations (Fig. 3).

Clinical examination showed a diffuse swelling on the right side of the

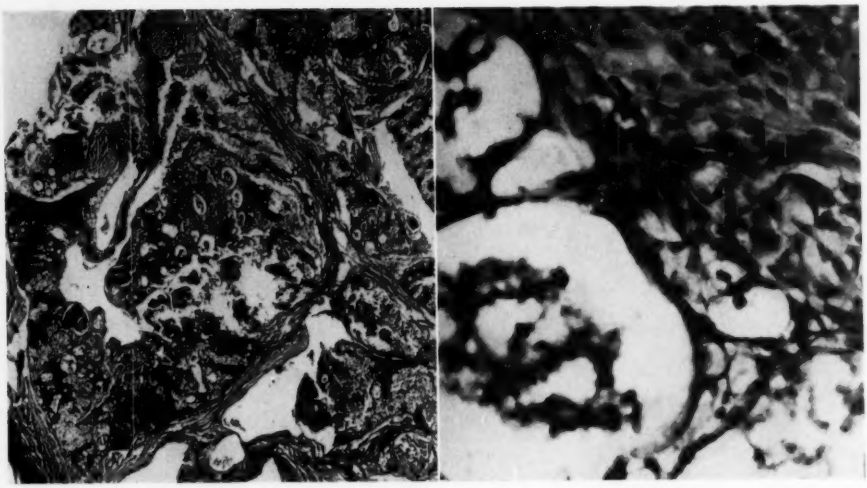

Fig. 2.—Photomicrographs, low and high magnification. Note the connective tissue stroma within which there are glandular acini and epithelial rests

palate. The growth extended from the bicuspid region into the soft palate. The overlying mucous membrane was unbroken but it was thinned out and notably discolored. Upon palpation, the mass was found firmly adherent to the underlying periosteum, was soft, and suggested a lymphoid tissue content. Because of its

Fig. 3.—(Case 2) Mixed tumor of the palate. Note the diffuse, lobulated appearance and the discoloration of the unbroken mucous membrane. This growth was not completely encapsulated

soft consistency and doubtful encapsulation, a biopsy specimen was taken after aspiration had yielded a negative result.

The growth was removed in May 1940. The anterior greater portion of the growth was found encapsulated and was easily dissected out. The posterior portion merged into the substance of the soft palate and into the anterior pillar of the fauces; however, the neoplastic tissue could be differentiated from the normal and was removed accordingly. The pathologic report was mixed tumor of the palate, suggestive of lymphocytic type (Fig. 4).

Prompt cicatrization followed, and the patient was dismissed on June 3, 1940. As the patient lived at some distance from the city, she was not seen thereafter.

CASE 3—The patient, a woman of 57, was first seen in April 1941. She was edentulous and had been wearing a full upper denture for five to seven years. For several weeks, however, she had noted that the denture, which normally fitted well, was being dislodged by a growth upon her palate (Fig. 5).

Examination disclosed a neoplastic mass upon the left side, at the junction of the hard and soft palate. The growth measured about 2.5 cm. anteroposteriorly and about 2 cm. transversely. It was cov-

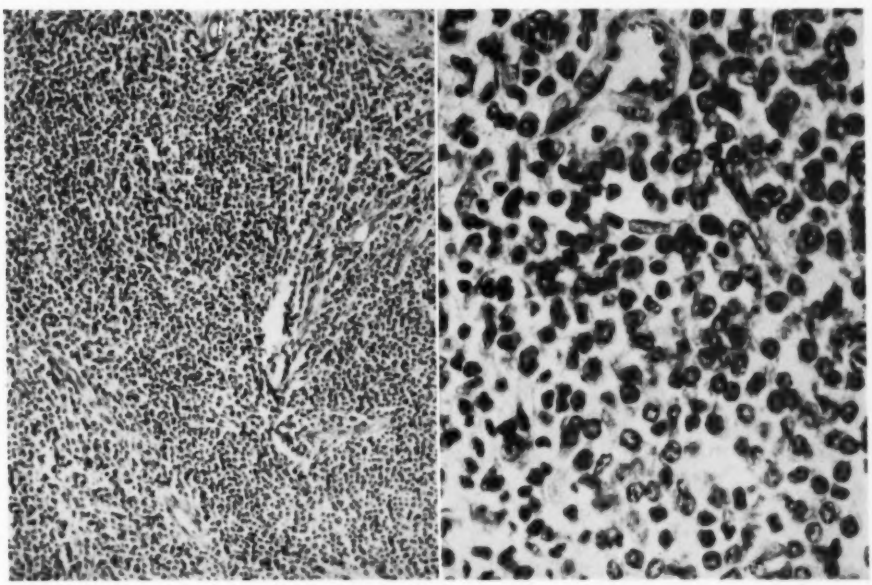

Fig. 4.—This specimen was subject to variable interpretations. The histology is strongly suggestive of lymphocytic type of lymphosarcoma. Clinically, however, the lesion was clearly benign and was completely enucleated

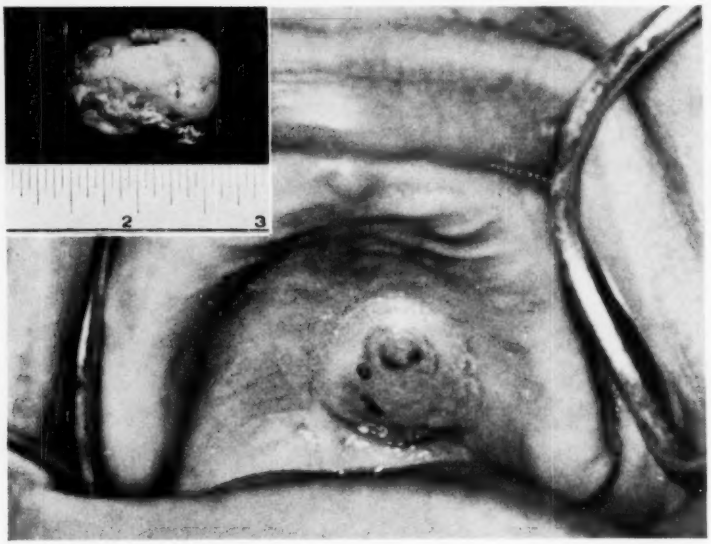

Fig. 5.—(Case 3) Mixed tumor of the palate and the encapsulated specimen removed

ered with normal mucous membrane showing a small area of erosion at its anterior part, probably caused by the chafing of the denture.

Upon the inner surface of the denture, a depression was noted which corresponded to the location of the growth. It may be assumed that the growth, although smaller, was present at the time the impression was taken for the denture.

The growth was removed in May 1941. The growth as removed is shown in the inset of Figure 5.

The growth was completely encapsulated and contained structures of salivary gland type. The pathologic report was salivary-gland tumor or mixed tumor of the palate.

The case was followed up for eight and a half years. No recurrence was noted.

CASE 4—The patient, a woman of 52, was first seen in November 1941. For six months or longer, she had been conscious of some discomfort caused by an ulcer upon her palate. Upon her physician's advice, she used various mouth washes in the hope that a cure would be effected. Clinical examination showed a neoplasm at the junction of the hard and soft palate, with a broken down crater-like ulcerated center (Fig. 6). The mucous membrane surrounding the ulcer was somewhat inflamed, but was otherwise intact. This is the only case in this series in which a deep-seated ulceration was found penetrating into the tumor proper. Despite the ulceration, the growth displayed no malignant characteristics and bore the clinical marks of a mixed tumor.

A biopsy specimen was taken to as-

Fig. 6.–(Case 4) Mixed tumor of the palate. This is the only case in the series in which the lesional area presented a deep, penetrating ulcer

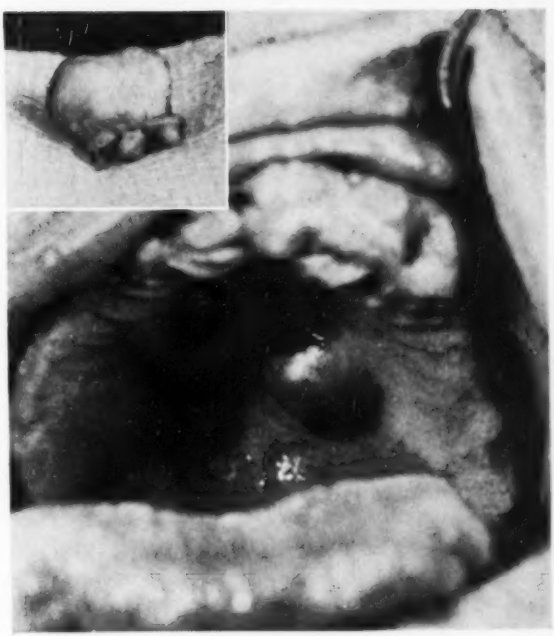

Fig. 7.–(Case 5) This tumor is well circumscribed and was lodged somewhat more anteriorly than it is usually found

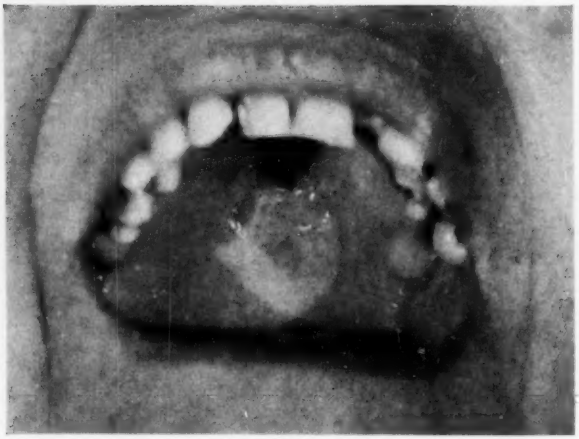

Fig. 8.–(Case 6) Mixed tumor of the palate which caused no discomfort until recently, when patient felt that the growth was getting larger

certain the true nature of the neoplasm. The pathologic report was mixed tumor of the palate. The patient failed to return after the biopsy was taken.

CASE 5—The patient, a woman of 57, was first seen in August 1943. The growth present on the left side of her palate was discovered when she applied for dental attention and to have a few remaining upper teeth removed (Fig. 7).

The lesion was covered by normal mucous membrane, was firmly attached to the periosteum and appeared to be completely encapsulated.

The growth was removed on August 2. At operation, it was found to be completely encapsulated and was removed *in toto*. The pathologic report was mixed tumor of the palate. The wound healed promptly and, after 14 days, the patient was dismissed.

She was seen periodically for the six months following the operation. By that time, she was wearing a full upper denture with comfort. There were no signs of recurrence when seen six years later.

CASE 6—The patient, a woman of 60, was first seen in May 1944. She had noticed the growth upon the left side of her palate about five or six years previously. As there were no disturbing symptoms, she paid no attention to it. More recently, however, she was under the impression that the mass was getting larger. Clinical examination revealed that the tissues over the posterior palatine foramen were somewhat raised. The mass was ovoid in outline, about the size of an almond and slightly movable. The overlying mucous membrane was not broken but was altered in texture and partly ulcerated (Fig. 8). The completely encapsulated growth was removed on May 26, 1944. The wound did not heal by first intention. The patient was followed for five years and three months and there was no recurrence.

The specimen consisted of an encapsulated round mass of tissue measuring

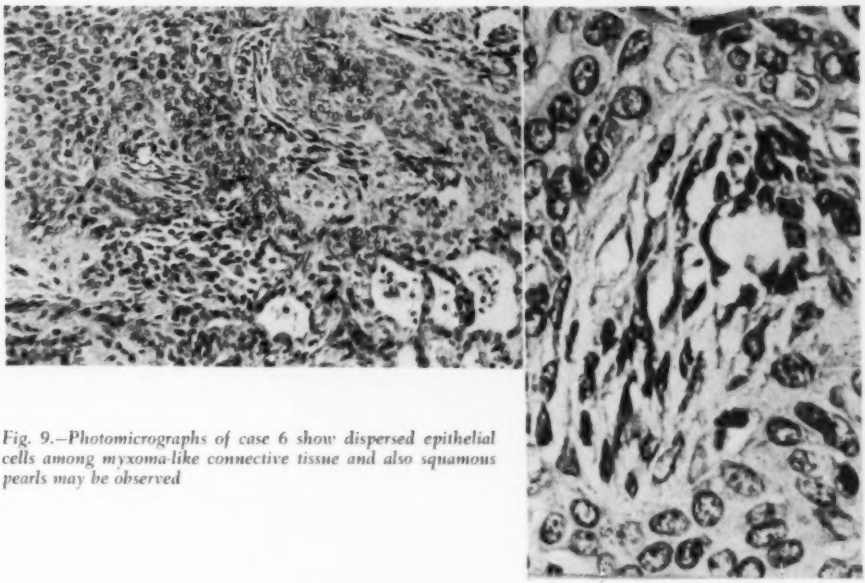

Fig. 9.—Photomicrographs of case 6 show dispersed epithelial cells among myxoma-like connective tissue and also squamous pearls may be observed

about 1 by 1 by 1 cm. It was whitish in color and had a fibrous tissue consistency. Microscopically, some of the sections showed small areas of salivary gland tissue on the external surface of the specimen. The tumor appeared to be completely encapsulated and was composed of cords and nests of epithelial cells dispersed in a loose myxoma-like connective tissue stroma. Some of these epithelial cells showed a tendency to the formation of alveoli, a number of which contained colloid-like material. In other places the formations of squamous pearls was observed. The diagnosis was mixed tumor of the palate (Fig. 9).

CASE 7—The patient, a man of 59, was first seen in October 1944. For several weeks, he had noted a smarting and stinging sensation on the left side of the palate, which was aggravated by spicy food. More recently, deglutition had become painful. Upon examination, a swelling was noted on the left side of the palate over the area of the posterior palatine foramen (Fig. 10). The surface tissues were found inflamed and ulcerated. It was apparent, however, that the lesion was not inflammatory and was not caused by infection, but that, instead, its nature was that of a neoplasm. The inflammation and ulceration were obviously caused by traumatization from food. The growth had probably been present for several years and would have remained unnoticed had it not been for the more recent discomfort. The growth appeared to be encapsulated and the covering mucous membrane was quite thick. The growth was

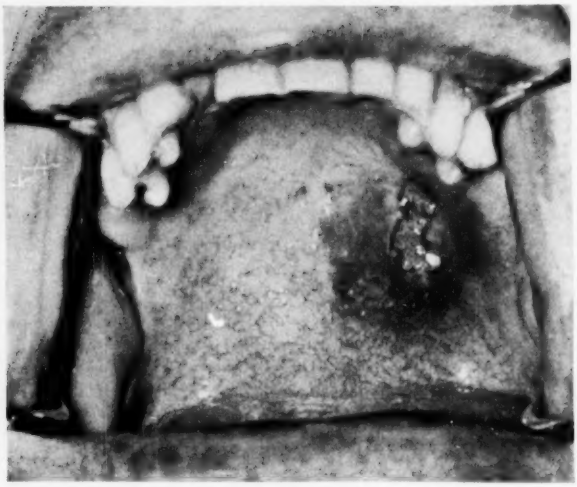

Fig. 10.–(Case 7) Note the ulceration and the inflammatory discoloration of the tumor area. The ulceration may have been caused by traumatization from food, and the subsequent irritation led the patient to seek medical attention

removed on October 17, 1944. The preoperative impression of complete encapsulation was confirmed in the operation. The pathologic report was mixed tumor of the palate. The wound healed uneventfully and the patient was dismissed 16 days after the operation. He did not return for follow-up treatment.

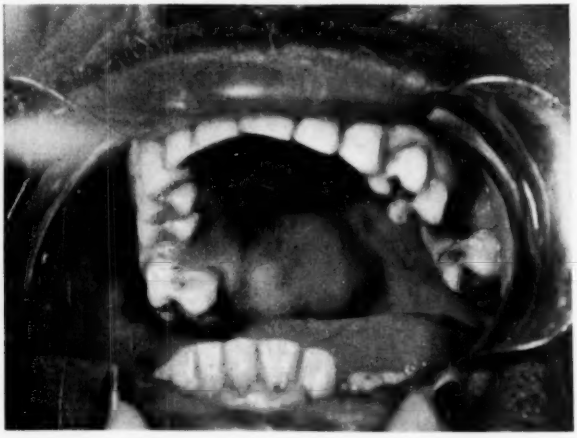

Fig. 11.–(Case 8) This growth was discovered in a routine oral examination. The histologic findings were suggestive of malignancy. Clinically, the growth was benign

CASE 8—The patient, a man of 55, was first seen in July 1945. In routine oral examination for dental complaints, a growth was observed on the right side of his palate. Although the tumor was fairly large, he had been entirely unaware of its presence. The tumor extended from the bicuspid region anteriorly, its posterior portion merging into the soft palate (Fig. 11). It was covered by normal mucous membrane and was firmly attached to the underlying periosteum. Upon palpation, it felt like a soft rubber ball and appeared to be encapsulated. In the operation, performed on October 19, 1945, it was found that the major anterior portion of the growth was encapsulated. The posterior portion, however, merged into the soft palate and had to be removed in several fragments.

The specimen consisted of irregular fragments of tumor tissue, the largest of which measured 2 cm. in diameter. Microscopically, there appeared to be carcinoma-forming glandular structures in some places. Most of the tumor was composed of solid lobules and sheets of cells, suggestive of a salivary gland origin (Fig. 12). The pathologic diagnosis was mixed tumor of the palate. Although the histologic findings suggested possible malignancy, the growth proved to be benign. The patient was seen for postoperative care and for observation until February 26, 1946, at which time the wound was found completely cicatrized and epithelized.

CASE 9—The patient, a boy of 17, was first seen in January 1946. He was suffering from pain caused by carious teeth, and, in the course of the dental ex-

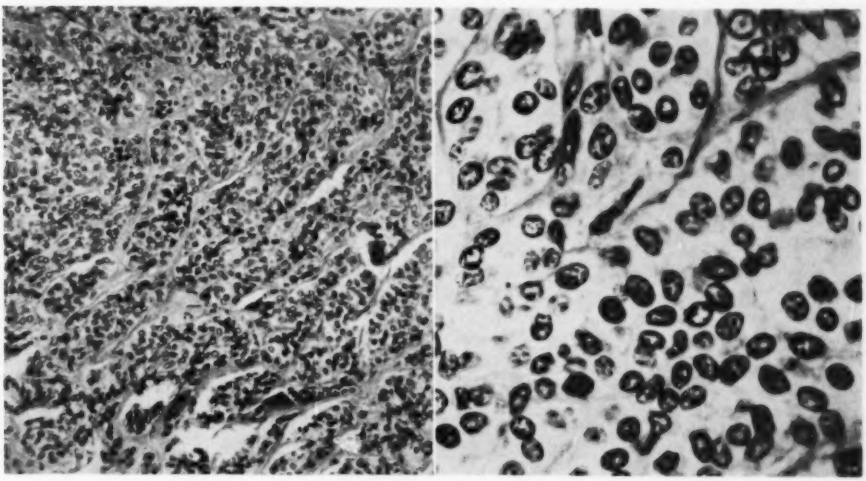

Fig. 12.—Photomicrographs from case 8. Note the numerous mitotic cells and the mosaic-like partitioning of the connective tissue stroma

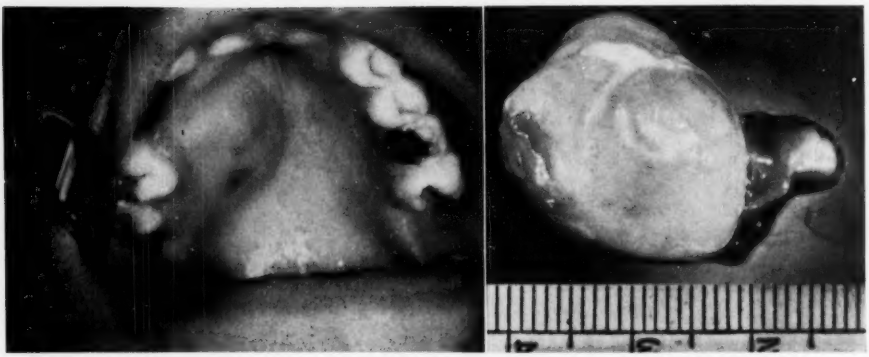

Fig. 13.—(Case 9) The boy was troubled with pain, caused by carious teeth, and, in the examination, the tumor was discovered. Right: The tumor as it was dissected out in toto

amination, the growth was discovered. In the course of the year, the mass had been incised by others on two different occasions under the impression that it represented a dental abscess. Upon more careful examination, it was obvious that it was a neoplasm. The growth was covered by normal mucous membrane except where it showed the scars of the former incisions, at which points the mucous membrane was closely adherent to the neoplastic tissue within. As the clinical examination suggested complete encapsulation, no biopsy was taken. The growth was removed completely. The clinical photograph and the encapsulated tumor are shown in Figure 13.

The specimen measured 2.5 by 1.3 by 1.2 cm. The growth was composed largely of compound and complex glandular structures lined sometimes by deeply stained cuboidal cells with clear cytoplasm (Fig. 14). The pathologic diagnosis was mixed tumor of the palate.

The patient was followed for three and a half years after the operation. There was no sign of recurrence.

CASE 10—The patient, a woman of 55, was first seen in April 1946. She had noticed the swelling for the first time about 10 days previously, by passing her finger over it. Although it was of considerable size, no disturbing symptoms or physical discomfort were experienced at any time.

Clinical examination disclosed a tumor on the right side of the palate (Fig. 15). The growth appeared to be encapsulated, and extended from the lateral incisor region to the junction of the hard and soft palate. The covering mucous membrane was normal. Upon palpation, it was found strongly adherent to the periosteum and was compressible to a moderate degree. The clinical diagnosis was mixed tumor of the palate. On April 4, 1946, the growth was removed intact. It was found completely encapsulated in a grayish, glistening, fibrous tissue.

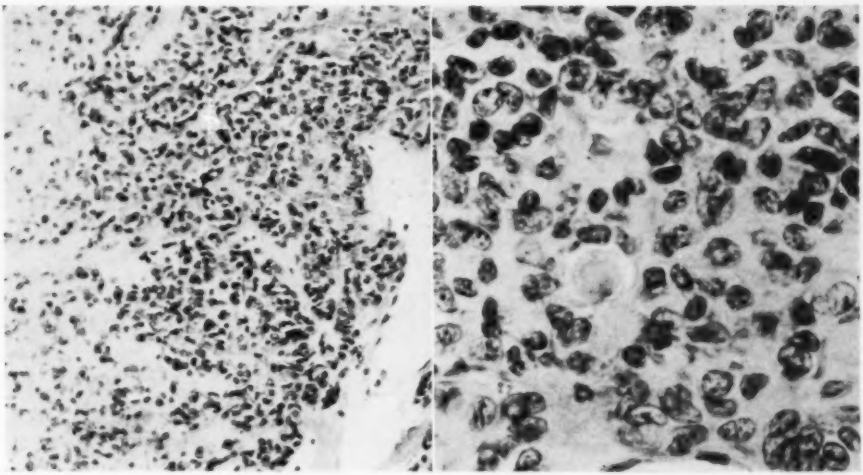

Fig. 14.—The growth is composed largely of complex glandular structures lined sometimes by deeply stained or cylindrical epithelial cells and epithelial cells with clear cytoplasms. This stroma is fibrous and does not show mucoid or cartilaginous metaplasia

The specimen was an encapsulated tumor 2 by 1.5 by 1.5 cm. in diameter. On cut section, it revealed a whitish center with slit-like spaces, some of which contained a yellow, gelatinous material. Microscopically, the contents presented a varied picture. There were some highly cellular areas, without any characteristic

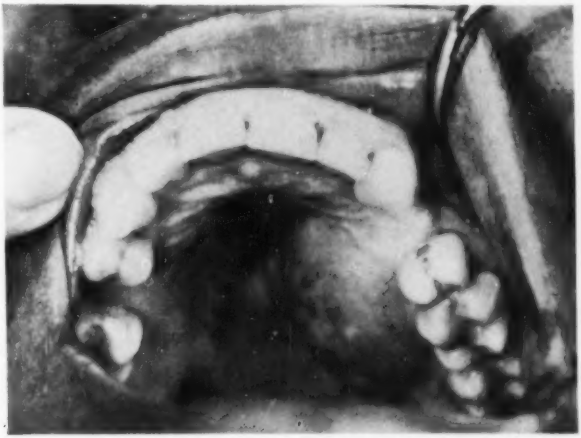

Fig. 15.—(Case 10) The growth appeared to be well circumscribed and was soft and spongy upon palpation. Aspiration was negative for cystic content. On removal, the tumor was completely encapsulated

arrangement. In a few areas, the cells were formed into rosettes and primitive acini. The matrix was quite dense at some points, while at others the loose matrix contained numerous vacuoles. One portion of the tumor showed well-developed acini, filled with colloid and islands of epithelial cells, some of which were suggestive of epithelial pearls. Throughout the specimen, there were many large dilated lymphatics and cystic endothelial-lined spaces. The pathologic diagnosis was mixed tumor of the palate. The patient was seen about one year later. Epithelization was complete and there were no signs of recurrence when seen three and a half years later.

CASE 11—The patient, a woman of 23, was first seen in September 1947. She had noticed a swelling in the mouth about a year and a half previously. During the last six months it had seemed to increase in size and she, therefore, sought attention. There was a growth on the left side of the palate, extending from the third molar to the cuspid region. Laterally, it was located entirely on the hard palate, a few millimeters above the gingival margin of the adjacent teeth and about 5 mm. distant from the median line (Fig. 16). The growth was covered by normal mucous membrane and was compressible, but not fluctuant. It appeared to be completely encapsulated. All the teeth were present in faultless condition. The clinical preoperative diagnosis was mixed tumor of the palate.

The growth was removed on September 18, 1947. It was found completely encapsulated and was dissected out *in toto*.

The tumor tissue was found in a connective tissue stroma which exhibited only infrequently pale-staining basophilic

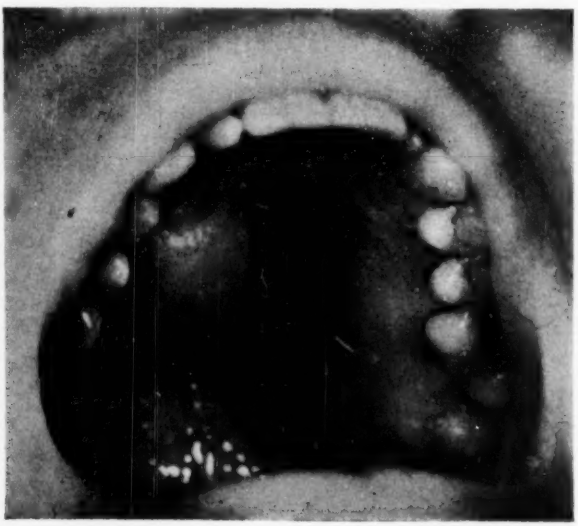

Fig. 16.—(Case 11) Mixed tumor of the palate. Patient noticed the swelling about a year previously and she seemed to think that it was growing larger. The growth was found encapsulated and was removed in toto

Fig. 18.—(Case 12) Mixed tumor of the palate. The growth, although of unusual size, was discovered in routine dental examination

areas of myxoid material. A very striking appearance was created by the unusual amount of squamous cell metaplasia within the ducts and glands, in a definite arrangement of glandular formation (Fig. 17). There were no malignant characteristics. The pathologic diagnosis was mixed tumor of the palate.

The patient was dismissed on October 15, and during the subsequent six months no recurrence was noted.

CASE 12—The patient was a white man 51 years of age, who was seen about 25 years previously. The only available record is the photograph (Fig. 18). All other pertinent data are presented from recollections alone. The growth was of considerable size and was lodged on the right side of the palate. It penetrated somewhat beyond the median line to the left side. Its duration could not be determined, as the patient was not troubled by disturbing symptoms and was not conscious of its presence, despite its size. His attention was directed to the growth by the dentist, who had removed the teeth now missing on the opposite side. The growth was covered with normal mucous membrane, presenting neither breaks nor points of irritation. Aspiration was done and a biopsy specimen was taken. In the operation, the growth was found to be completely encapsulated and was dissected *in toto*. The wound healed uneventfully. The pathologic report was mixed tumor of the palate. The patient was seen periodically for two years following the operation. There was no sign of recurrence.

■ *Summary and Conclusions*

This report is based on 12 cases of mixed tumors of the palate, and presents their photographs, their pathology, the method of removal and the results obtained.

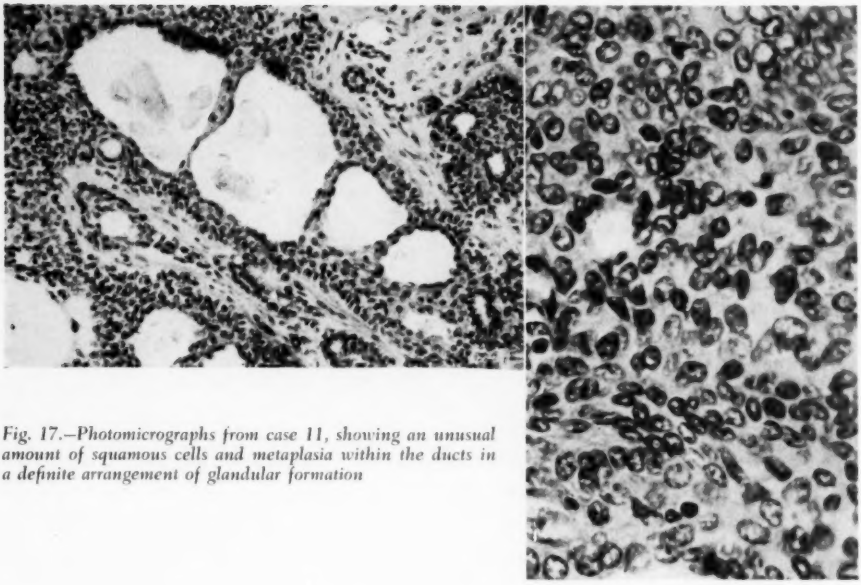

Fig. 17.—Photomicrographs from case 11, showing an unusual amount of squamous cells and metaplasia within the ducts in a definite arrangement of glandular formation

The ages of the patients ranged from 13 to 72 years. Four of the twelve patients were males and eight were females.

The duration of the growths could not be determined, as none caused disturbing symptoms at first. Some were discovered in incidental oral examinations; others were noticed by the patient when the growth had attained an advanced size. In some of the cases, painful surface lesions developed. No relationship was discovered, on medical examination, between the general health of the patient and the growths.

It is probable that there is a genetic similarity between these growths and other mixed tumors about the head and neck region, which frequently exhibit malignant tendencies. Those of the palate, however, are distinctly benign.

The morphologic pattern of these growths is widely variable, often suggesting malignancy. Judgment as to possible malignant tendencies should not be based upon their histology alone, and their benign clinical behavior must be seriously considered in their treatment.

Two types of growths were grossly recognized; those which were completely and those which were only partly encapsulated. Those of the first type were simply enucleated. Those of the second type were removed by careful dissection. Neither thermal or chemical cautery nor excessive bone curettage was used.

Some of the cases were followed up for 3 to 10 years. No signs of recurrence were noted in any of these cases.

Sclerosing solution in the treatment of chronic subluxation of the temporomandibular joint

■ *L. E. McKelvey, D.D.S., Ann Arbor, Mich.*

Subluxation may be defined as a self-reducing incomplete dislocation. It was first described by Sir Astley Cooper who attributed the condition to an abnormal relaxation of the capsular ligaments permitting excessive joint movement. Frequently there may be displacement of the meniscus.

Pain or annoying crepitation are usually the impelling factors that bring the patient to the physician or dentist for relief. The complex of symptoms that arise from various conditions in this region can lead to inaccurate diagnosis. Consequently, treatment may be inadequate or unsatisfactory and the condition will remain unimproved.

Particular care must be exercised in correlating the subjective symptoms, especially those given by an apprehensive or neurotic patient, in order to arrive at a correct diagnosis. The accurate gathering of a comprehensive history is essential.

For a better understanding of the temporomandibular joint and the condition of subluxation, a brief review of the anatomy will help. It is a ginglymo-arthrodial joint capable of motion in all directions except axial rotation. The bony articular parts are the ovoid condylar head of the mandible and the concave glenoid fossa of the temporal bone with its anterior convex extension, the articular eminence. The condylar head is held in its relation to the glenoid fossa by four ligaments: the capsular, the temporomandibular, the stylomandibular and the sphenomandibular. The capsular ligament, which is a thin, loose envelope, is attached to the circumference of the glenoid fossa and to the anterior aspect of the articular eminence. Below it is attached around the neck of the condyle. The temporomandibular ligament is attached to the lateral tubercle of the articular eminence and the adjacent zygomatic arch. It runs diagonally downward and backward to the distolateral aspect of the condylar neck (Fig. 1). On the medial aspect of the mandible are shown the sphenomandibular and stylomandibular ligaments which assist in maintenance of the articular relation but do not enter into its formation as component parts (Fig. 2).

In a sagittal section of the articulation the fibrocartilaginous disc or meniscus can be seen lying between the condyle and the mandibular fossa with a superior and an inferior synovial ligament. Fibers of the external pterygoid muscle insert into the anterior and medial aspects of the meniscus, capsular ligament and neck of the condyle. Figure 3 is a diagrammatic representation of the temporomandibular joint showing the superior and inferior

Lt. Col. (DC) U. S. Army, University Hospital, Department of Oral Surgery, University of Michigan, Ann Arbor, Mich.

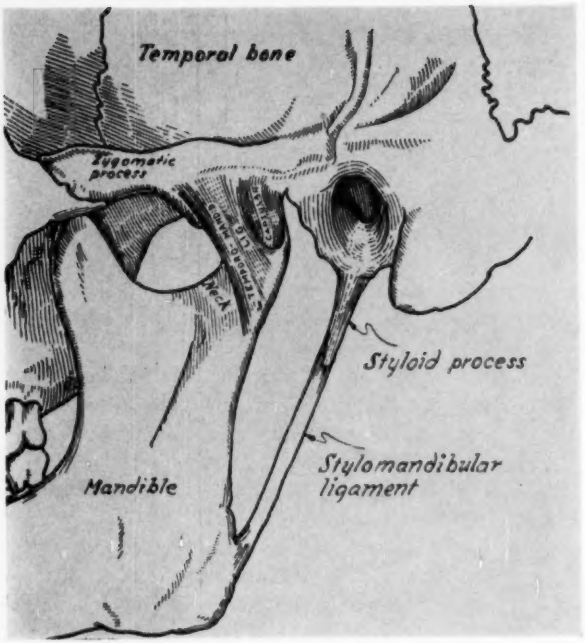

Fig. 1.—Articulation of the mandible. Lateral aspect. (From Gray[1])

synovial chambers as patent cavities. Actually, these cavities are only potential spaces with the superior and inferior synovial membranes closely approximated in each chamber. These membranes are lubricated by a small amount of synovial fluid which facilitates the smooth movement of one membrane over the other during mandibular excursion. The articular aspects of the glenoid fossa and condylar head are covered with a tough fibrous periosteum and not with cartilage. This is one condition unique to only the temporomandibular joints.

In the normal joint when the mouth is opened the condyle, along with the disc, moves forward onto the articular eminence. In subluxation the latitude of movement is increased with stretching or tearing of the capsular ligament, the peripheral attachment of the meniscus or the fibers of insertion of the external pterygoid muscle. The injury may involve all three. The failure of the meniscus to maintain its normal relation in mandibular excursion may lock the jaws in certain positions, resulting in crepitation, trismus and pain. Both temporomandibular joints may be involved; more often the involvement is unilateral.

The condition of subluxation of the mandibular joint is by no means rare. Many patients give a history of having

1. Gray, Henry, *Anatomy of the Human Body*. Philadelphia: Lea & Febiger, 1946.

sought treatment without avail. Some have received various treatment regimes which have proved inadequate or unsatisfactory. Failure in diagnosis, lack of knowledge of proper treatment, or a tendency to minimize the distress that these patients have may account for unsuccessful treatment.

The etiologic factors are numerous. A blow to the jaw may cause a luxation or subluxation of one or both condyles. Prolonged oral operations, as in restorative dentistry, use of excessive force in the extraction of a tooth, broncoscopy, tonsillectomy and the use of a mouth gag under general anesthesia may be primary causes. Yawning or positional pressure may cause the disturbance. Other causes which may lead to recurrent or chronic subluxation are excessive tooth abrasion, certain masticatory habits, congenital deficiency of the meniscus, infectious processes (local, by extension or hematogenous), recurrent external trauma, malocclusion and unilateral overwork.

The diagnosis of hypermobility is simply ascertained by palpation of the excursion of the condyle on opening the mouth and by viewing the extent of opening. During movement grating, crepitation, or "popping" may be felt, or even heard. This may be due to irregularity of the joint surfaces, irregularity of the meniscus, or to the meniscus being caught in an eccentric position from which it snaps, or is folded, as the joint relations

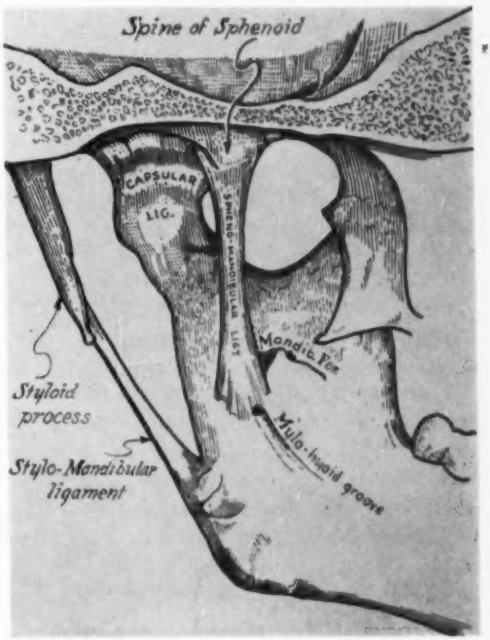

Fig. 2.—Articulation of the mandible. Medial aspect. (From Gray[1])

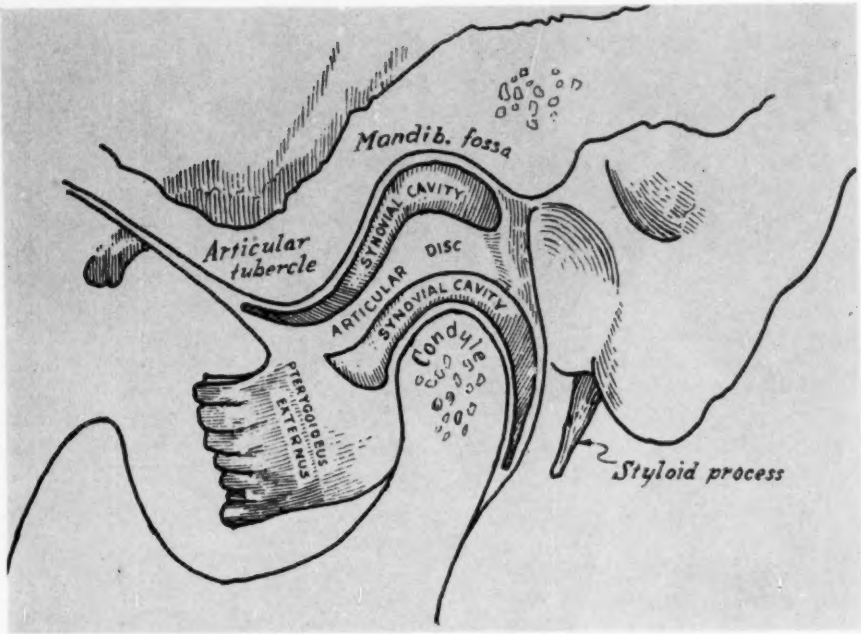

Fig. 3.—Sagittal section of the articulation of the mandible. (From Gray[1])

change. The meniscus may become wedged between the joint surfaces on opening, closing, or when pressure is exerted on the jaw, causing a temporary "locking" of the parts. The fibrocartilage may be fractured in this action, or, if recurrent over a period of time, formation of certain types of tumors such as sarcoma, osteoma, chondroma and myxochodroma may result.[2] Pain usually occurs with sharp onset during luxation or crepitation, subsiding to a dull ache which may persist for varying lengths of time after the trauma. The pain may radiate from the site of the joint in an anterior direction from the tragus of the ear or to an area over the cheek or temple. Some patients develop a phobia of exciting pain or of being embarrassed while talking or eating with a group because of audible crepitation. If involvement is unilateral, there is a tendency to favor that side, and the jaw may deviate to that side on opening.

For differential diagnosis certain other conditions affecting the temporomandibular joint must be considered such as those arising through loss of vertical dimension, arthritis (atrophic or hypertrophic), neuralgia, referred pain from the

2. Schultz, Louis W., Report of Ten Years' Experience in Treating Hypermobility of the Temporomandibular Joints. *J.O.S.* 5:202 (July) 1947.

mastoid, ear, or jaw, sphenomaxillary tic, congenital joint defects and direct extension into the joint from an adjacent infectious process. A complete and accurate history is of prime importance in the differential diagnosis.

Lateral temporomandibular roentgenograms taken with the mouth in the open and closed positions are desirable but usually they are of little value.

■ *Methods of Treatment*

Many methods of treatment have been devised giving varied results. The most commonly used are fixation of the jaw, restriction and scope of movement, use of sclerosing agents within the joint capsule, traumatizing of the joint surfaces, or surgical intervention.

Intermaxillary fixation by splints, wiring, or chin-strap appliances have proved unsatisfactory in most recurrent subluxation cases. In these, tissue changes have taken place which rest does not usually cure, but may only temporarily relieve the symptoms. In the acute phase of luxation, subluxation, or trauma there is trismus. This is nature's way of splinting the joint to allow healing of the torn tissues, ruptured vessels and stretched ligaments. In treating these cases the mandible is immobilized for three or four weeks until the acute symptoms have disappeared and healing is assured. If afterwards there is indication of subluxation, the treatment offered by Schultz[2, 3, 4] is carried out.

Orthodontic appliances or a chin strap to restrict latitude of movement of the mandible have been used by Brophy[5] and others.

Traumatization of the joint surfaces by scarifying with a needle, as advised by Dorrance[6] has been found painful and likely to produce complications such as osteomyelitis or ankylosis. One theory suggests that relaxation of the ligaments may be due to a defect of the intracellular substance and collagen in the fibrous connective tissue secondary to a deficiency of vitamin C. Supporting literature for this concept has not been encountered.

Surgical removal of the meniscus, in whole or in part, and the introduction of a fascial or fat pad between the articulating surfaces are more radical procedures. The placing of mattress sutures in the capsule, as proposed by Morris[7] is equally difficult. The greatest disadvantages to surgical treatment are the possibilities of injury to branches of the facial nerve, scarring, extraoral parotid fistula, possible ankylosis resulting from infection of the joint or damage to the articular surfaces, in addition to the physical difficulty in the surgical removal of the disk.

Considering the advantages and disadvantages of the various methods of treatment of this syndrome, it is believed that the method advocated by Schultz[3] offers the most good for the majority of cases.

In 1937 Schultz[3] submitted a new treatment for luxation and subluxation of the temporomandibular joints. This method grew from exhaustive experimentation on dogs. The idea was fostered

3. Schultz, Louis W., A Curative Treatment for Subluxation of the Temporomandibular Joint or of any Joint. *J.A.D.A.* 24:1947 (Dec.) 1937.

4. Schultz, Louis W., and Shriner, Walter, Treatment of Acute and Chronic Traumatic Temporomandibular Joint Arthritis. *J. Florida M. A.* 30:189 (Nov.) 1943.

5. Brophy, T. W., *Textbook of Oral Surgery*. Philadelphia: Blakiston Company, 1915, p. 424.

6. Dorrance, G. M., *Essentials of Oral Surgery*. St. Louis: C. V. Mosby Company, 1944, p. 218.

7. Morris, J. H., Chronic Recurring Temporomaxillary Subluxation. *Surg., Gynec. & Obst.* 50:483 (Jan.-June) 1930.

by experimentations of Rice,[8] McDonald,[9] Mayer[10] and others who were seeking a means of curing hernia, by the injection of sclerosing agents such as sodium morrhuate, alcohol, tincture of iodine and urea hydrochloride. Rice[8] found that sodium psylliate solution produced an increase in collagenous tissue without ill effects. From this investigation in the use of 5 per cent sodium psylliate emulsion (Sylnasol) injected into the temporomandibular joints of dogs Schultz[2] observed, at necropsy, normal joint cavities with firm fibrous capsules. Histologically, as well as clinically, the solution did not act on sensory nerves such as the mandibular and infraorbital, or cause paralysis of the sciatic or femoral nerves when deposited about them. Injection into the peritoneal cavity, lung, liver, or blood vessels produced no immediate or remote ill effects. From these results he drew the conclusions that: (1) It is the best of the sclerosing solutions to use for the treatment of the mandibular joints in the conditions of subluxation or luxation. (2) A dense fibrous capsule is formed when the solution is injected into the joint cavities and there are no ill effects. (3) There are no adhesions in serous cavities following its use, or ill effects on the viscera. In the dog the toxic dose is 6 cc. per kilogram of body weight.

■ *Technic*

Usually, the patient is premedicated with morphine sulfate, ⅙ grain. A 2 cc. tuberculin syringe with a 26 gage, 1½ inch long, bevel steel needle is used. The areas anterior to the tragus of the ear and inferior to the zygomatic arch are prepared and strict sterile technic is followed. As the patient moves the mandible the path of the condyle is palpated. With the mouth open a depression is felt just anterior to the tragus of the ear, inferior to the zygomatic arch and distal to the condylar head, which is produced by the forward and downward path of the condyle as it leaves its posterior position in the fossa. A mouth prop is placed at this time to prevent involuntary closure of the mouth which would result in breaking the needle. With the index finger in the lower half of this depression the needle is inserted just above the finger and directed superiorly and mesially until the mesial wall of the glenoid fossa is contacted (Fig. 4). The needle is withdrawn a few millimeters and the piston retracted to ascertain if a blood vessel has been entered. If blood is withdrawn, remove the needle further, reinsert in a slightly different direction and repeat the procedure. Inject very slowly 0.5 cc. of the solution into the joint. This position of the needle will usually permit filling of the superior synovial chamber. Even though the condition is unilateral, injections are usually made bilaterally. The bilateral injections are advised to prevent derangement of the occlusal balance which is more apt to occur when repeated unilateral injections are made on the same side. Occasionally, when there is unilateral severity of symptoms, it may be well to increase by one or two the number of treatments on that side. The quantity of solution for each injec

8. Rice, C. O., Rationale of Injection Treatment of Hernia. *Minnesota Med.* 18:623 (Sept.) 1935.

9. McDonald, G. A., Ambulant Treatment for Herniae. *Illinois M. J.* 48:399 (Nov.) 1925.

10. Mayer, Ignatz, Treatment of Hernia by Subcutaneous Injection. *M. J. & Rec.* 125:528 (April 20); 596 (May 4); 672 (May 18) 1927; 128:415 (Oct. 17) 1928; 131:90 (Jan. 15) 1930.

tion should not be more than 0.5 cc. In most cases two or three series of injections will effect a cure. It is not desirable to give more than four or five series of injections to any one patient. If the condition is not relieved or improved by the time three or four injections have been made it may be inferred that either the diagnosis is incorrect or that the treatment will not benefit that particular case. Generally, the injections are spaced at intervals of one to two weeks. It has been found advantageous in several extreme cases of recurrent luxation to give one series of injections into the capsule from the anterior approach between the articular eminence and the condyle with the jaw in the closed position. The needle is directed superomesiodistally to contact the anterior aspect of the condylar head. In this manner the inferior synovial chamber is injected. Care must be exercised in passing the needle in this position, since the space is quite narrow. This seems to have a more pronounced effect in limiting the scope of movement to a point short of luxation or subluxation.

Care must be taken to avoid injection into the middle ear, into blood vessels, or the periarticular spaces. According to the experimental data such errors will not produce serious complications, but, of course, correction of existing symptoms cannot be expected when the solution is not properly placed.

The patient may experience a feeling of fullness in the ears. Postoperative medication of codeine, 1 grain, aspirin, 10 grains every four hours if necessary, for the first 24 hours is usually sufficient. Edema over the joints may persist for three or four days, there may be a numb feeling over the temples, salivation and a transitory prognathic malocclusion. Those who had the most severe symptoms and got the most reaction to the injections usually obtained the best results. The severity of the postinjection symptoms seem to show a fairly constant relation to the degree of resultant benefit. From this

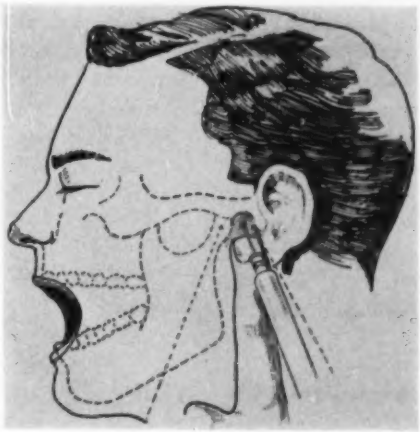

Fig. 4.—Posterior approach for injection into the temporomandibular joint

it is assumed that the degree of reaction is an indication of the magnitude of the eventual fibrosis.

After injection the patient should be advised not to yawn or force opening of the mouth, which would tend to preclude satisfactory results. A liquid diet is advised for the first three or four days, then change to soft. A regular diet is given as tolerated, about 10 days to two weeks after the last injection. The injection treatment is never instituted in acute conditions or where there is roentgenographic evidence of eroded condylar or glenoid surfaces which are painful or show limitation of movement. It is only used where there is evidence of excessive excursion or crepitation due to abnormal looseness of the capsular ligament.

Schultz and Shriner[1] have used this method in the treatment of more than 200 cases with gratifying results. Since learning of the procedure I have treated nearly a hundred cases in this manner and the results seem to support their observations. Schultz has been using 5 per cent Intracaine in Oil or 1 per cent Eucupin in Oil in place of the 5 per cent sodium psylliate emulsion. Sometimes he uses equal parts of the psylliate emulsion and one of the other agents. The Intracaine is a compound B-diethylaminoethyl P-ethoxybenzoate, and Eucupin is isoamylhydrocupreine. He believes that the two newer agents produce less discomfort but do not produce as great a degree of fibrosis as the emulsion.[2] I have used only the sodium psylliate emulsion in the cases treated.

In our series of cases we have found a fairly high percentage of cures with no complications to date. The figures show 75 per cent complete cures, 9 per cent improved, 11 per cent failures and 5 per cent questionable. In the group of improved cases the clinical symptoms were cleared but some subjective symptoms remained, or treatment was terminated before completion. The group of failures and questionable cases may be attributed to faulty diagnosis complicated by other concurrent conditions, unreliable information by the patient concerning the subjective symptoms, or other unknown factors. Frequently patients present a picture of loss of vertical dimension with that of chronic subluxation. In these cases it is desirable to have the restoration of the vertical dimension completed before beginning the injections of the joints. In fact, all operations which require wide opening of the mouth should be completed prior to starting the injections.

After the injections have been completed, it is advisable to check the occlusion and correct it if there has been any change brought about by the previous treatment. Occlusal balance is essential. This check should be repeated 30 days after completion of the initial treatment.

The following four case reports were taken from the group of patients treated by the injection technic. They are random selections presented only to demonstrate the practical application of such treatment.

CASE 1—The patient, a white man, aged 26, first noticed pain radiating in an anterior direction from the left ear about four months prior to admission. The onset of pain was occasioned by chewing of solid foods. He was not aware of any injury which might be the cause. At first the masticatory stress at meal times caused

a dull ache to increase gradually as the meal progressed but would slowly recede after the meal. Later the pain became more intense when chewing and persisted as a dull ache between meals. At the time of admission to our clinic the pain was sufficient to cause loss of sleep and restriction of his diet.

Examination—The patient appeared to be a well nourished, active man with a "drawn" facies. The mandibular excursion was unrestricted with a tendency toward subluxation on the left. There was no crepitation. The occlusion was normal and balanced.

Roentgenographic Observations—Lateral roentgenograms of the left and right temporal joints, with the mouth in the open and closed positions, were negative.

Impression—Chronic subluxation of the left temporomandibular joint.

Treatment—Treatment consisted of bilateral injections by the posterior approach, of 0.5 cc. of 5 per cent sodium psylliate emulsion, on February 7, 1945. Moderate reaction followed with slight tenderness over the tragus of the ear, subsiding in 48 hours.

On February 14, the second injections, bilaterally, were administered. Recovery was uneventful.

On February 20, occlusion was balanced by spot grinding. Painful symptoms on chewing nearly disappeared.

The patient was completely free of discomfort by April 12. Mandibular excursion was normal. There was no evidence of subluxation. The occlusal balance was satisfactory.

CASE 2—Six months prior to admission to the hospital the patient, a white man, aged 27, received multiple lacerations of the face and scalp, inflicted by a bomb blast. Bilateral recurrent painful subluxation was evident soon after with an increase of pain on mastication. Pain of lesser intensity persisted between meals. The injury did not fracture any of the bones of the face, cranium or mandible.

Examination—This patient of husky build appeared to be in some distress. His face bore multiple scars with the characteristic bluish cast found in wounds that have been contaminated by soil or powder particles and which could not be completely débrided. There was no evidence of facial asymmetry or other abnormal condition except for the bilateral subluxation. Occlusal relations and balance were satisfactory.

Roentgenographic Observations — Roentgenograms of the temporal joints revealed no radiopaque foreign bodies in the vicinity of the articulations. The articular surfaces appeared normal.

Treatment—Bilateral injections, by the posterior approach, of 0.5 cc. of 5 per cent sodium psylliate emulsion were made on March 7, 1945. Moderate bilateral intracapsular edema and tenderness ensued with a slight prognathic occlusal relation which disappeared by the third day.

The second series of bilateral injections was made on March 12. Similar postinjection symptoms and recovery were experienced, as with the first injections.

The third bilateral injections were made on March 20. The postinjection symptoms were slightly increased in intensity. Temperature of 100.2 F. was present the first day after the injections. The temperature returned to normal the next day and recovery was uneventful.

Occlusion was balanced by April 2. The subluxation was cured. Mandibular excursion was slightly restricted in the lateral movements. Little or no correction of the painful symptoms was noted.

On April 30, 1945, there was normal range of mandibular movement. Occlusion was satisfactory. Painful symptoms persisted. Further similar treatment was believed to be of no value for this patient. He was referred to the Otology Department for recheck and to the Neurology Department for evaluation.

CASE 3—The history dated back approximately eight years. At that time the patient, a Negro man, aged 25, suffered a blow to the chin in a fist fight. Pain and tenderness over the joint areas persisted for several days. Soon after he noticed that when eating, yawning, or laughing his jaw seemed to "slip out of joint" on one or both sides. Usually he could return it to place but occasionally he would have to seek aid to accomplish reduction. Both the luxations and the subluxations would give painful symptoms lasting for a day to a week or more. In the interim periods the patient did not elicit pain during mastication. In the last three or four years the frequency of recurrence of symptoms increased. About three years previously he was treated by immobilizing the mandible with arch bars and intermaxillary elastic traction for a period of one month. Nine months previously this method of treatment was repeated for a period of six weeks. The condition remained unchanged. The patient was admitted to this hospital as an emergency case after having suffered a bilateral luxation of the temporal joints which had remained unreduced for nearly nine hours. The dislocations occurred when the patient was on the train going home for a furlough. He was reluctant to leave the train to seek aid until pain, thirst and hunger make it necessary.

Examination—This tall, slender, asthenic Negro man showed signs of acute distress and dehydration. The mouth was held open by the evident bilateral temporal joint dislocations. The areas over the joints were taut, swollen and tender to palpation. The temporal and masseter muscles were taut and hard.

Treatment—Premedication of morphine sulfate, ¼ grain, was administered and the luxation was reduced by manipulation on March 14, 1947. Ten per cent glucose in normal saline solution was given in intravenous injections totaling 2,000 cc. over the following eight hour period. This helped replace body fluids and nutriment. The patient was then placed on a high caloric, protein and vitamin liquid diet. The limitation of movement disappeared rapidly but the joint edema and tenderness were only slightly reduced.

Roentgenographic Observations—The lateral roentgenograms of the temporal joints with the jaw in the open and closed positions were negative except for slight flattening of the prominence of the articular eminences, bilaterally.

Further Treatment—On March 22, 1947, the acute symptoms had subsided. The extent of mandibular excursion indicated that treatment should be instituted to prevent future recurrences of luxation or subluxation. Bilateral injections of 0.5 cc. of the emulsion were made through the posterior approach. Moderate

edema and discomfort followed. Symptoms were resolved completely on the fifth postinjection day.

Because of the extreme excursion it was deemed advisable to make the second bilateral injections anterior to the condylar head on March 29. The reaction was moderate to severe. The recovery period was extended to six days. At that time the mandibular excursion had been greatly reduced.

A third series of injections was made through the posterior approach on April 7. The subsequent reaction and recovery were similar to that following the second series.

On April 19, there was slight residual tenderness over the mandibular joints on palpation and on attempted extreme opening. The mandibular excursion was safely short of possible luxation or subluxation. The lateral movements were somewhat restricted. The occlusion was balanced by spot grinding.

The previous tenderness to palpation and opening had disappeared by May 25. Mandibular movements were within normal range; all symptoms had completely cleared. Occlusion was satisfactory.

CASE 4—The patient, a white man, aged 19, received a blow on the face in an auto accident 16 months prior to admission to the hospital. The incident was followed by pain and restricted movement of the mandible lasting for several weeks. These symptoms were succeeded by subluxation, crepitation and discomfort. The symptoms were more prominent on the left. The condition was treated by intermaxillary fixation 10 months following the injury, but without success.

Examination—The patient appeared to be a healthy young man, active and of medium build. He was not in acute distress. There were no apparent abnormalities except for the bilateral subluxation and crepitation of the mandibular joints with accentuation of the crepitation on the left.

Roentgenographic Observations—The lateral temporal joint roentgenograms were negative.

Impression—Chronic bilateral subluxation of the temporal joints.

Treatment—Treatment consisted of posterior bilateral injections of 0.5 cc. of the emulsion on February 3, 1948. Slight postinjection edema and tenderness of the joint areas persisted for the first day but were resolved by the end of the second day.

A second series of injections was given February 9. There followed a mild reaction with an uneventful recovery.

The mandibular excursion was within normal limits by February 27. There was complete clearance of the crepitation in the right joint but there was a minimal irregularity still evident on the left. There was some discomfort in the mastication of hard foods. The occlusion was balanced by spot grinding.

The crepitation had completely disappeared from both joints by March 10. There was no subluxation. The occlusion was satisfactory. There was no discomfort on mastication.

■ *Conclusions*

The material in this paper is offered as support to the experimentation and research of those who have given the profession this method of injection of sclerosing agents for the treatment of recurrent

luxation and subluxation of the temporomandibular joints.

The 5 per cent sodium psylliate emulsion in oil has proved to be an excellent promoter of fibrosis and it is innocuous to other tissues.

The procedure is simple and offers good results with little chance for complications.

The random cases reported in this paper are representative examples of those treated in the manner just described.

Cleidocranial dysostosis

■ *Harry M. Seldin, D.D.S.; S. Daniel Seldin, D.D.S., and William Rakower, D.D.S., New York*

When certain skeletal, facial and oral malformations occur, with a concomitant failure of the clavicles to develop, a syndrome is produced which is called cleidocranial dysostosis.

Of particular interest to the dentist is the fact that, associated with the lack of clavicular development, there is a prolonged retention of the deciduous dentition and a failure of eruption in the permanent dentition. It leads to the question of what forces are responsible for the eruption of the permanent teeth. Are the forces which lead to normal clavicular development the same as those which produce normal tooth eruption? What factors were missing to produce a malformed clavicle; and are these same factors necessary for eruption of teeth?

The answer to these questions might give a better insight into the mechanism of tooth eruption.

Massler and Schour[1] have shown that the hypophysis is of great importance in this problem. They have shown that in hypophysectomized animals eruption ceases, but root elongation continues with folding and buckling. It will be noted that malformed, folded and buckled roots of the unerupted teeth are associated with cleidocranial dysostosis.

It was also found that, with hypophysectomy, there is a reduced vascularity of the periodontal tissues.

The evidence presented by these investigators shows that a decreased eruption rate is correlated with a decreased vascularity of the periodontal tissues. This is circumstantial evidence tending to support the theory that eruption is begun and accelerated by pressure due to vascularity of the periapical tissues. In hypophysectomy the periapical vascularity is reduced, and the teeth fail to erupt. In hyperpituitarism there is an increase in vascularity of the periodontal tissues, and an increase in eruption rate.

1. Massler, M., and Schour, I., Studies in Tooth Development: Theories of Eruption. *Am. J. Orthodontics* 27:552 (Oct.) 1941.

It could be inferred, from their work, that some hypophyseal dysfunction may be an underlying factor in the production of the syndrome of cleidocranial dysostosis.

This peculiar syndrome was reported more than 175 years ago. In 1897 Pierre Marie, and Paul Sainton cited four cardinal signs in its recognition.[2] They were: (1) aplasia of one or both clavicles; (2) exaggerated development of the transverse diameter of the cranium; (3) delay in ossification of fontanels; (4) hereditary transmission. The disease was called by Marie and Sainton "cleidocranienne dysostose hereditaire."

Although numerous cases have been reported,[2-9] the condition is still considered a rare development, the cause of which is unknown. It is most frequently, but not necessarily, hereditary and may be transmitted by either parent to an offspring of either sex. It is transmitted as a mendelian dominant characteristic, so that half of the anticipated children of a parent with cleidocranial dysostosis have a chance of being normal physically.[6]

Those affected are generally of short stature. The clavicles are defective, varying from defects of the acromial end to complete absence. This point can be ascertained by the fact that the patient can bring his shoulders forward till they meet (Fig. 1). Roentgenograms will verify the absence or underdevelopment of the clavicles (Fig. 2).

The skull is large and brachycephalic, with a tendency for the fontanels and sutures to remain patent. There is a bulging of the frontal region with a sagittal groove between, dividing the forehead (Fig. 1). From a pyschiatric standpoint,[5] patients with cleidocranial dysostosis have a normal mentality, and represent a cross section of the general population.

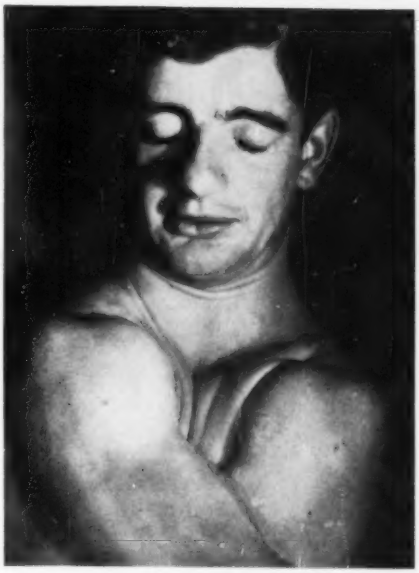

Fig. 1.—Photograph of patient showing shoulders brought forward, almost until they touch. Note brachycephaly, bulging of frontal region, broad nose with depressed bridge

The nose is broad, with the bridge depressed or flat (Fig. 1). The maxilla is usually underdeveloped with a consequent

2. Winter, G. R., Dental Conditions in Cleidocranial Dysostosis. *Am. J. Orthodontics* 29:61 (Feb.) 1943.

3. Thoma, K., *Oral Pathology*. St. Louis: C. V. Mosby Co., 1941, pp. 326-331.

4. Millhon, J. A., and Austin, L. T., Dental Findings in Four Cases of Cleidocranial Dysostosis. *Am. J. Orthodontics (Sect. Oral Surg.)* 30:30 (Jan.) 1944.

5. Kilgore, S., and Lasker, G. W., Cleidocranial Dysostosis and Psychosis. *Arch. Neurol. & Psychiat.* 56:401 (Oct.) 1946.

6. Miles, P. W., Cleidocranial Dysostosis: A Survey of Six New Cases and 126 From the Literature. *J. Kansas M. Soc.* 41:462 (Nov.) 1940.

7. Fitzwilliams, D. C. L., Hereditary Cranio-cleido-dysostosis With Review. *Lancet* 2:1466, 1910.

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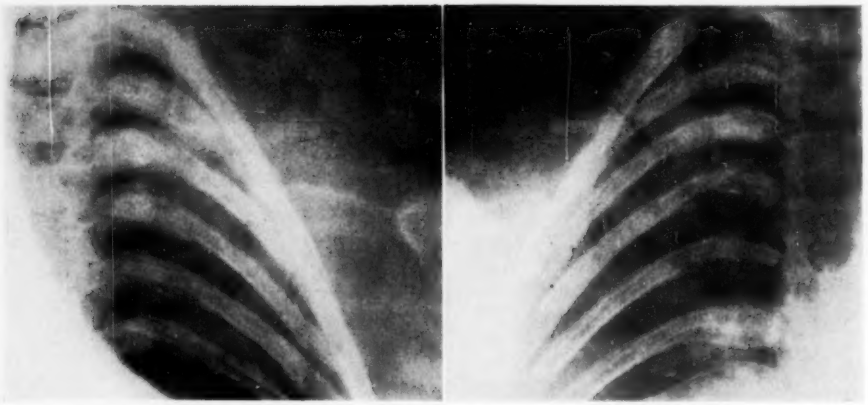


Fig. 2.—Roentgenograms of the chest region revealed underdevelopment of the clavicles on both sides

apparent mandibular prognathism. There is a high narrow arched palatal vault which occasionally may be cleft. The maxillary sinuses are very small or entirely absent. The deciduous teeth are retained to maturity, and the permanent teeth remain embedded. The teeth are completely formed, often with distorted and buckled roots, there being no suppression of odontogenic activity. There is, however, a suppression of eruption; eruption being defined as the migration of the formed tooth through the bone. Supernumerary teeth are often found in this condition, also unerupted. The molar teeth, those with no predecessors, are more likely to erupt normally (Fig. 3).

The prolonged retention of the deciduous teeth and failure of most of the permanent teeth to erupt, obviously leads to malrelation of dental arches with consequent periodontoclasia and necessity for prosthetic replacements. It is felt by some[4] that dentures should be worn, and each embedded tooth removed, as it appears from time to time under the denture. Such a course of action would inevitably lead to many surgical operations, with as many renewals or rebasings of the artificial dentures. We believe that, in selected cases, all the embedded teeth, together with the deciduous dentition, may be removed, in one or more sittings, in relatively close order, thus obviating the necessity for repeated operation. Inherent in such a procedure is the danger of losing excessive bone, with consequent inability to comfortably wear artificial dentures. It is shown in the case reported here, that all the lower embedded teeth, together with the deciduous teeth, may be removed, with preservation of a full, adequate and ample mucobuccal fold and a full complete ridge to accommodate the denture.

■ *Report of Case*

A 25 year old white male reported on March 22, 1948, with a history of

having had several embedded teeth removed from the maxilla three months previously.

Roentgenograms taken the same day revealed many embedded teeth in the mandible, and two embedded teeth still remaining in the upper left lateral region (Fig. 4). Figure 3 shows an intraoral roentgenographic series before any operating was done. The physical appearance of the patient was typical of cleidocranial dysostosis (Fig. 1).

According to the patient, his father and his father's five brothers all had the same condition, but his father's six sisters had no signs of it. The patient's brother and his only male cousin are normal.

On March 30, 1948, under bilateral inferior alveolar block anesthesia, 11 embedded permanent teeth and 4 erupted

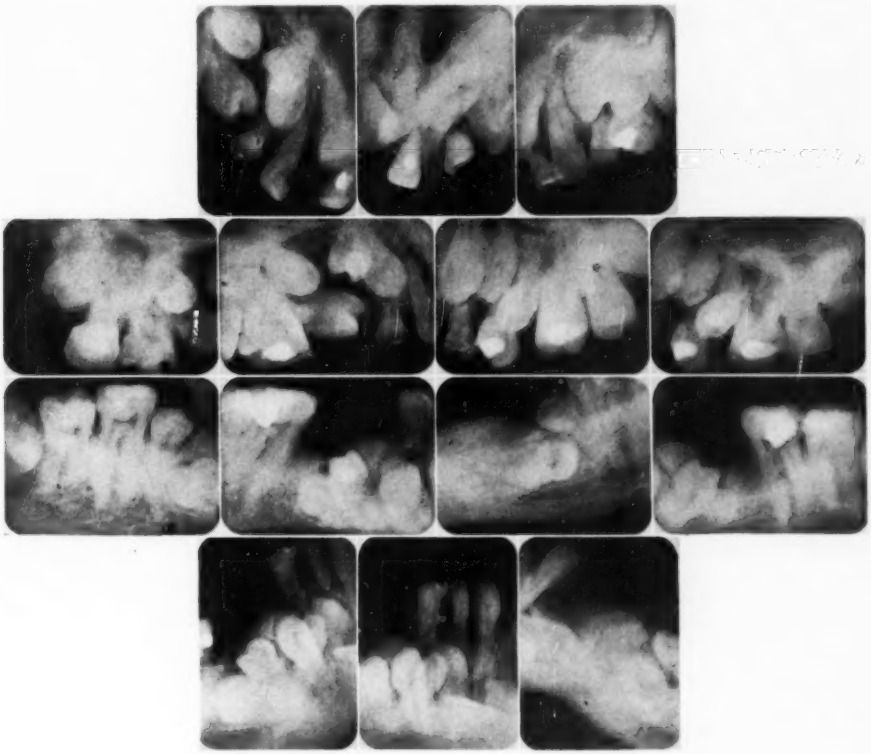


Fig. 3.—Preoperative intraoral roentgenographic series. The deciduous teeth are retained; the permanent teeth are completely formed with distorted and buckled roots; the molar teeth, with no predecessors, have erupted normally

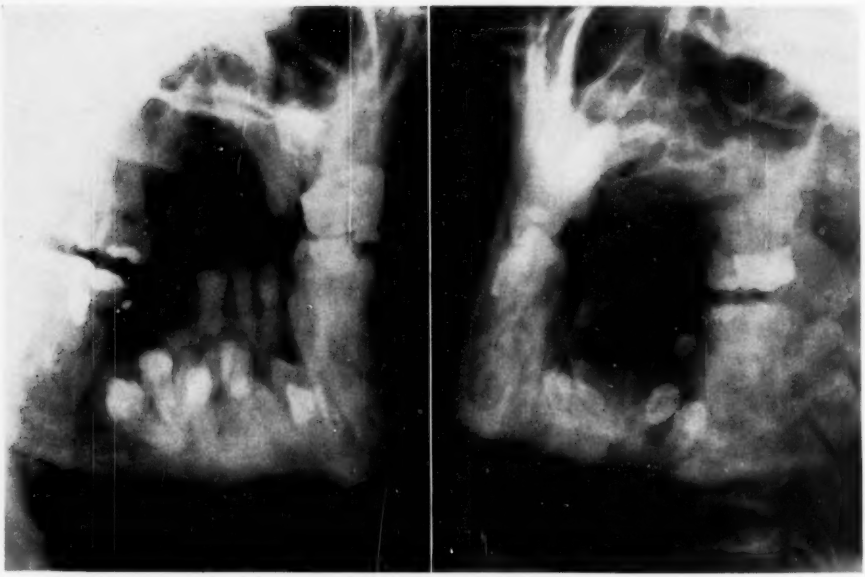


Fig. 4.—Preoperative roentgenograms showing the bunched embedded permanent teeth and the retained erupted deciduous teeth

deciduous teeth were removed from the mandible. The cavity was filled with sterile gelatin sponge saturated with benzene sulfonamide hydrochloride (Sulfamylon) and streptomycin solution, and closed with a continuous suture. Postoperative roentgenograms are shown in Figure 5, above.

The patient recovered uneventfully. The sutures were removed six days later.

On April 6, 1948, under local anesthesia, the two embedded teeth in the upper left anterior region were removed. The patient was referred back to his dentist for dentures.

At our suggestion the patient consulted an endocrinologist who could find no evidence of endocrine dysfunction. His report merely confirmed the diagnosis of cleidocranial dysostosis.

The patient was next seen on October 18, 1949, at which time he was comfortably wearing partial upper and lower dentures.

Roentgenograms taken on this date (Fig. 6, below) showed that an adequate bony ridge had been maintained. The patient's partial dentures are as comfortable and function as well as those of the average wearer of partial dentures. In addition, he is happy with the knowledge that no further operative procedures will have to be done in these regions. He has received a psychological lift from this fact together

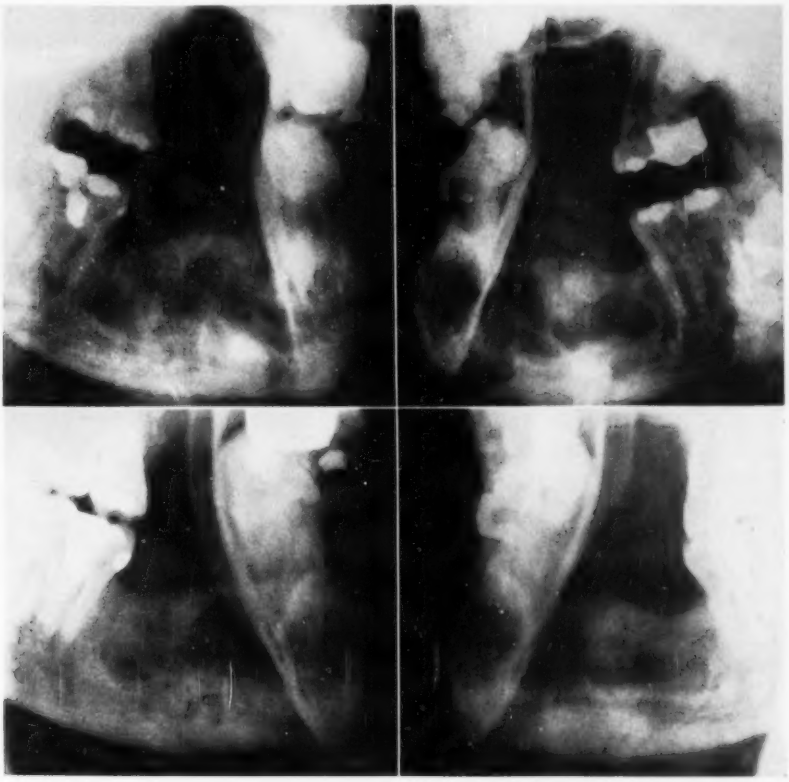


Fig. 5.—Above: Postoperative roentgenograms taken immediately after the operation. Note that the upper ridge of bone has been maintained. Below: Roentgenograms taken a half year after removal of teeth. Note beginning of bone regeneration

with the fact that he can now masticate his food adequately, smile and show his teeth normally.

■ *Summary and Conclusions*

1. Some signs of cleidocranial dysostosis have been given. It should be recognized that failure of tooth eruption alone does not justify a diagnosis of cleidocranial dysostosis, since the rate of eruption is retarded in hypopituitarism or hypothyroidism. An endocrinologic check up should be made in all such cases.

2. In the case here presented all the lower embedded teeth, as well as the remaining deciduous teeth, were removed in one sitting, with the maintenance of an ample, adequate ridge for accommodation of artificial dentures.—57 *West Fifty-seventh Street.*

Dental manifestation of scleroderma: *report of case*

Harold W. Krogh, D.D.S., Washington, D. C.

This case is presented because it corroborates the findings of Stafne and Austin, calls attention to a condition which is probably not always recognized as being related to changes in the skin and shows that the changes in the periodontium may be reversible.

A nurse, aged 53, was referred by her dentist for an opinion on three pulpless teeth which he had been observing. There were no roentgenographic signs of infection. Comparison of roentgenograms taken October 15, 1945, and April 23, 1947, showed a thickening of the periodontal membrane space, with partial disappearance of the lamina dura, not previously present around the lower right second bicuspid and first molar, and the lingual root of the upper right first molar (Fig. 1).

HISTORY—Roentgenograms taken May 19, 1939 showed no changes in the periodontium which could not be attributed to the effects of infection.

TREATMENT—Although the changes in the periodontium were recognized as atypical of infection or trauma, it was decided to remove

1. Stafne, E. C., and Austin, L. T., Characteristic Dental Finding in Acrosclerosis and Diffuse Scleroderma, *Am. J. Orthodont. & Oral Surg. (Sec. Oral Surg.)* 30:25 (Jan.) 1944.

Fig. 1.—Comparison of roentgenograms taken in 1945 (left) and 1947 (right) showed a thickening of the periodontal membrane space, with partial disappearance of the lamina dura, not previously present

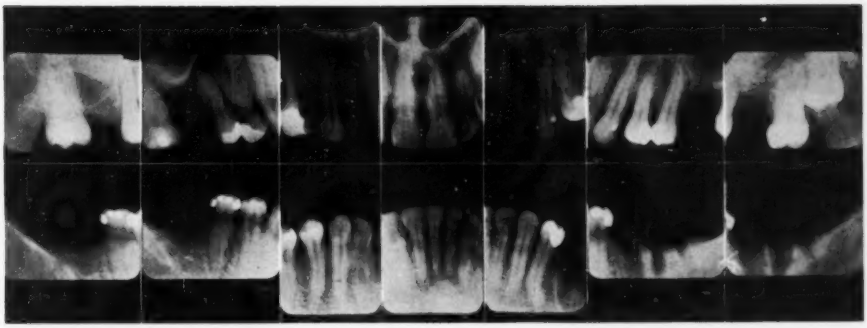


Fig. 2.—The vital left upper and lower second bicuspids exhibited changes in the periodontium similar to those around the pulpless teeth which had been removed in May

the three pulpless teeth. Accordingly on May 1, 1947, those teeth were removed under thiopental sodium anesthesia. While the patient was reacting from the anesthetic it occurred to me that the conditions in the roentgenogram were similar to those described by Stafne and Austin[1] in 1944 in patients suffering from acrosclerosis and scleroderma. Upon questioning she stated that for some time past she had been having trouble with the skin on the lower portion of her left leg.

Dental roentgenograms taken June 13, 1947, showed that the vital left upper and lower second bicuspids exhibited changes in the periodontium similar to those around the pulpless teeth which had been removed in May (Fig. 2).

FOLLOW-UP—The patient returned two years later on May 16, 1949. Dental roentgenograms taken then revealed a normal appearing periodontium around the left second bicuspids as well as around all other teeth and normal healing of the sockets created on May 1, 1947 (Fig. 3). The mucous membranes were normal in color and texture. All teeth were vital. The

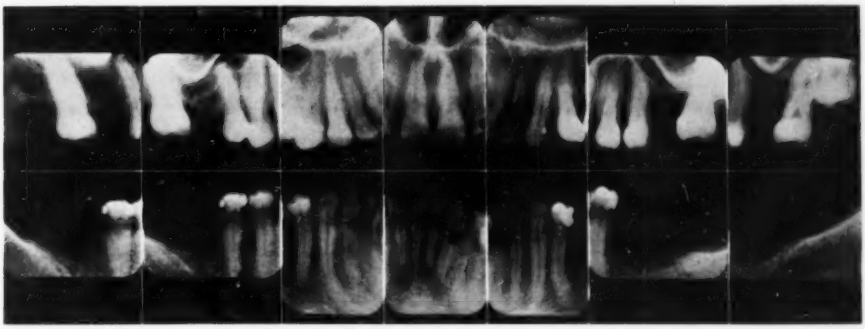


Fig. 3.—Roentgenograms taken in 1949 revealed a normal appearing periodontium around the left second bicuspids as well as around all other regions

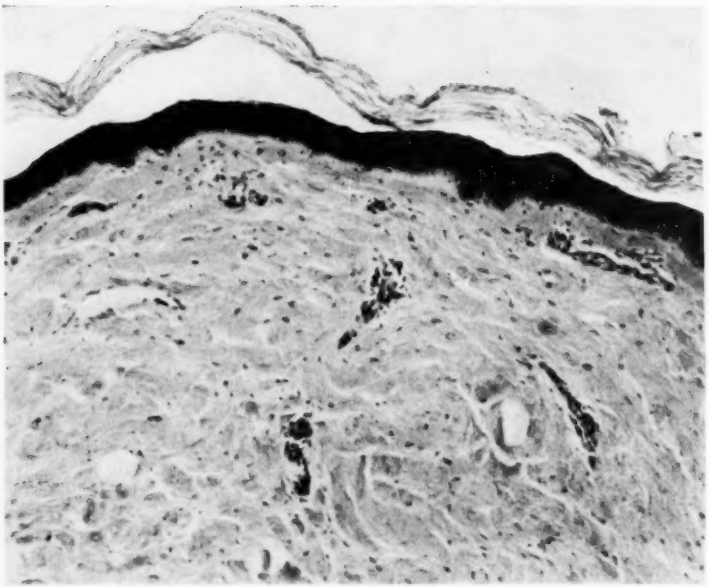


Fig. 4.—The blood vessels were widely spaced and thick-walled. There were a few mononuclear cells about them

patient's skin, however, had continued to give her trouble, with the right arm now also affected. She now complained of a constant heaviness with intermittent swelling of the left leg and right arm.

She consented to a biopsy and was sent to a dermatologist, with the tentative diagnosis of scleroderma.

Examination revealed the right forearm and left lower leg, both anterior and posterior surfaces, were affected. Infiltrated areas were approximately 10 cm. in length and 0.5 cm. in width. These areas were somewhat indurated and when examined closely, appeared to have an ivory-like hue. Involved areas appeared slightly depressed below the normal level of the skin. Difference in temperature between these areas and normal skin was apparent. The skin was smooth and firm and no visible evidence of atrophy was observed.

The dermatologist concurred in the diagnosis of scleroderma and took a biopsy from the calf of the left leg.

HISTOLOGY—Histologic examination revealed changes in the skin compatible with scleroderma. The report from the Armed Forces Institute of Pathology was: Examination of the section of skin confirms the clinical diagnosis of scleroderma. The epidermis, while acanthotic, is atrophied, particularly in the malpighian layer and the pegs are practically all ironed out. The dermis is converted largely into a mass of thick collagenous fibers which extend to the depth of the section. Hair follicles, sweat ducts and sebaceous glands are all absent or atrophied to the point of nonrecognition. The blood vessels are widely spaced and thick-walled. There are a few mononuclear cells about them.

A photomicrograph of the skin lesion is shown in Figure 4.—*1835 Eye Street.*

Osteomyelitis in fatal lymphatic leukemia: *report of case*

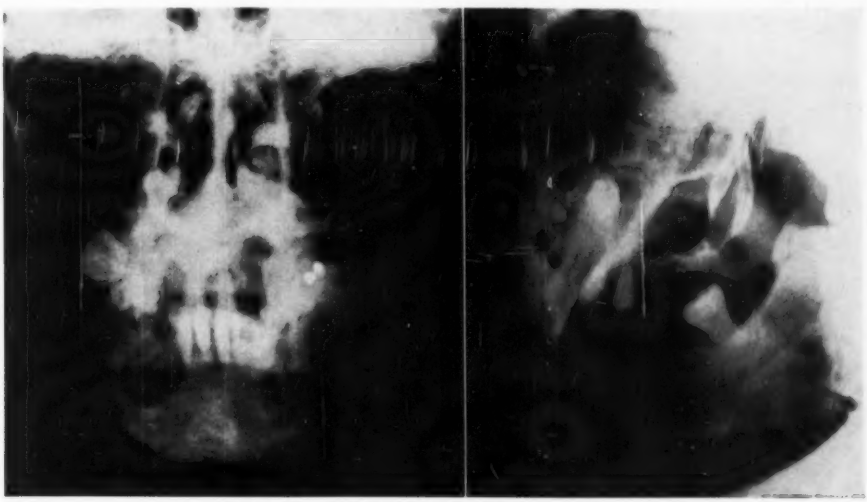
■ *C. Jay Brown, Jr., D.D.S., Kansas City, Kan.*

An acutely ill white man, aged 37, was admitted to Bethany Hospital on November 2, 1948.

Six weeks previous to admittance the patient had pain and swelling in the right mandible. The patient went to his dentist, who removed a lower molar tooth. Roentgenograms were not made before extracting the tooth. The swelling and pain continued after the extraction. Three weeks after the first tooth was removed, two teeth in the right mandible were removed in an effort to stop his pain. No roentgenograms were taken at this time. The pain and swelling continued. The patient stated that he was treated "off and on" with "sulfa" for two weeks by his physician. The patient had pain and numbness in both legs for several months.

The patient was transferred to the oral surgery department.

EXAMINATION—Physically the patient was pale and under weight. He appeared to be acutely ill. His heart and lungs were normal. His extremities were normal except for the numbness on the lateral aspect of both legs. There was some edema about the right mandible. The mouth was in a very poor state of hygiene. Extreme periodontal disease was



Left: Posteroanterior roentgenogram showing sharply delineated area of lysis characteristic of osteomyelitis. Right: Lateral roentgenogram showing area of lysis. In the center of the radiolucent area the sequestrating bone can be seen

Table 1
Results of admittance blood examination, November 2, 1948

Hemoglobin	38%
Erythrocytes	1,510,000
Leukocytes	3,800
Polymorphonuclear	21
Filamented	16
Nonfilamented	5
Lymphocytes	79
Monocytes	1
Eosinophils	0
Basophils	0
Metamyelocytes	0
Myelocytes	0

present. A large fistula in the region of the edentulous right bicuspid discharged thick yellow pus. The bicuspid region appeared inflamed and tender to palpation. The temperature was 100 degrees, the pulse 110, respiration 22.

Posteroanterior and lateral roentgenograms of the mandible (illustration) showed an area of bone lysis in the region of the right lower bicuspid. In the center of the radiolucent area was a sequestrum about 1 cm. in diameter. The area of lysis was rather sharply delineated and suggested osteomyelitis. There was advanced alveolar resorption about all of the remaining teeth. The diagnosis was chronic osteomyelitis of the right mandible.

TREATMENT AND COURSE—The patient was given 300,000 units of penicillin G in oil and wax and was scheduled for sequestrectomy November 3. However, the results of the laboratory examination of the blood (Table 1) were significant enough to warrant cancellation of the operation. The erythrocyte count of 1,510,000 denoted an anemia, making the patient an extremely poor anesthetic risk. The total leukocyte count was only 3,800. The differential white count showed a greatly reduced percentage of polymorphonuclear cells, but a largely increased percentage of lymphocytes. Of this large percentage of lymphocytes, there were 10 abnormal cells and 50 immature cells.

Since the removal of the sequestrated bone did not constitute an emergency, the operation was postponed and the patient was referred to the medical section for study of his blood condition. The altered white count probably was due to the sulfonamide therapy, or to a blood dyscrasia. Accompanying this condition was a severe anemia, possibly of the pernicious type, as suggested by symptoms of leg pain.

On November 12, 1948, the sequestrum appeared in the buccal fold and was removed with thump forceps.

Further blood studies resulted in the

Table 2
Results of blood studies, December 1, 1949

Hemoglobin	63%
Erythrocytes	2,000,000
Leukocytes	26,000
Polymorphonuclear	7
Filamented	0
Nonfilamented	7
Lymphocytes	93
Monocytes	1
Eosinophils	1
Basophils	0
Metamyelocytes	1
Myelocytes	0
Platelet	280,000
Nucleated erythrocyte	1 per 100 rbc
Megaloblast	2 per 100 rbc
Erythroblast	3 per 100 rbc
Total protein plasma	5.90%
Mean corpuscular volume	143 cu. microns

diagnosis of acute lymphatic leukemia (Table 2). The patient was treated with Aminopterin and liver, and received 14 whole blood transfusions before he died in June, 1949.

COMMENTS—Leukemia is a disease of the blood forming organs in which there is an enormous overproduction of leukocytes, enlargement of spleen and lymph nodes and changes in the bone marrow. The red cells are diminished in number, many of the individual cells are immature and abnormal forms appear. More evidence of immaturity of the cells is found as the process becomes more acute. Mouth symptoms are rare. Mead[1] has observed ten cases with oral symptoms. He mentions that it is very embarrassing and dangerous to remove teeth and later make a diagnosis of leukemia. He states that these patients are seriously ill, and there is enough danger in surgical intervention, even with complete knowledge of the existence of the disease.

The white count in leukemic patients is usually very high; however, full dependence should not be placed on a high leukocyte count. In the presence of acute or chronic leukemia the total leukocyte count may be less than 10,000 cells for each cubic millimeter of blood. A leukopenia may even be present.

During an acute illness there may occur at times regions of necrosis in the bone marrow. Such regions might conceivably predispose to infection. In this manner severe illnesses such as typhoid fever, smallpox, measles, diphtheria, or scarlet fever may lower the vital resistance of the tissues of the bone and encourage infection. Rather often an agranulocytic angina is accompanied by a necrosis of one or both of the jaw bones. It is not uncommon for leukemia to be accompanied by jaw necrosis.[2]

In the history of this case a medical intern noted that no roentgenograms were taken before the extraction of teeth. Dental practitioners should realize that preoperative roentgenograms should constitute a part of the data from which a diagnosis is made in all cases.

The importance of a careful medical history in all surgical cases cannot be overstressed. The routine laboratory blood and urine examinations are unnecessary in all cases, but the patient whose history is unusual should have the benefit of these important tests.—3320 *Strong Avenue.*

1. Mead, S. V., *Oral Surgery*, ed. 3. St. Louis: C. V. Mosby Company, 1946, p. 381.
2. Padgett, E. C., *Surgical Diseases of the Mouth and Jaws*. Philadelphia: W. B. Saunders Co., 1938, p. 294.

Open reduction of fractured mandible: *report of case*

■ *R. W. Wheelock, D.D.S., Mare Island, Vallejo, Calif.*

About midnight September 1, 1949, a well developed, well nourished, white male, 20 years of age, was brought to the hospital in a nauseated and semiconcious condition resulting from alcoholic indulgence and a severe beating. The mandible was fractured, with vertical and lateral displacement and severe compounding of the fragments into the oral cavity.

The physical examination revealed: temperature (axillary) 97.2; pulse 100; respiration 24; blood pressure 120/80; Bogen 0.0; Kahn negative; pin point pupils. The neck was swollen with a bluish discoloration across the manu-

The opinions of assertations contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

Commander, D. C., U. S. Naval Hospital, Mare Island, Vallejo, California.

brium and there were abrasions on the face. Family history and past physical history were negative, but the patient was suffering from severe emotional reactions.

A diagnosis of multiple compound fracture of the mandible was confirmed by posteroanterior and left and right oblique lateral roentgenograms (Fig. 1). These roentgenograms revealed an impacted third molar on each side in the line of fracture, the fractures being through each angle of the mandible. The inferior alveolar nerve was severed on both sides causing a paresthesia of the parts it supplied.

Sulfadiazine, 7½ grains, and sulfathiazole, 7½ grains every three hours for a period of 48 hours, after which every six hours, penicillin, 50,000 units intramuscularly every four hours, and meperidine (Demerol), 50 mg. intramuscularly every four hours if necessary to control pain, were prescribed. He was allowed nothing by mouth after 8 A.M. on September 2, and at 1 P.M. was given ¼ grain

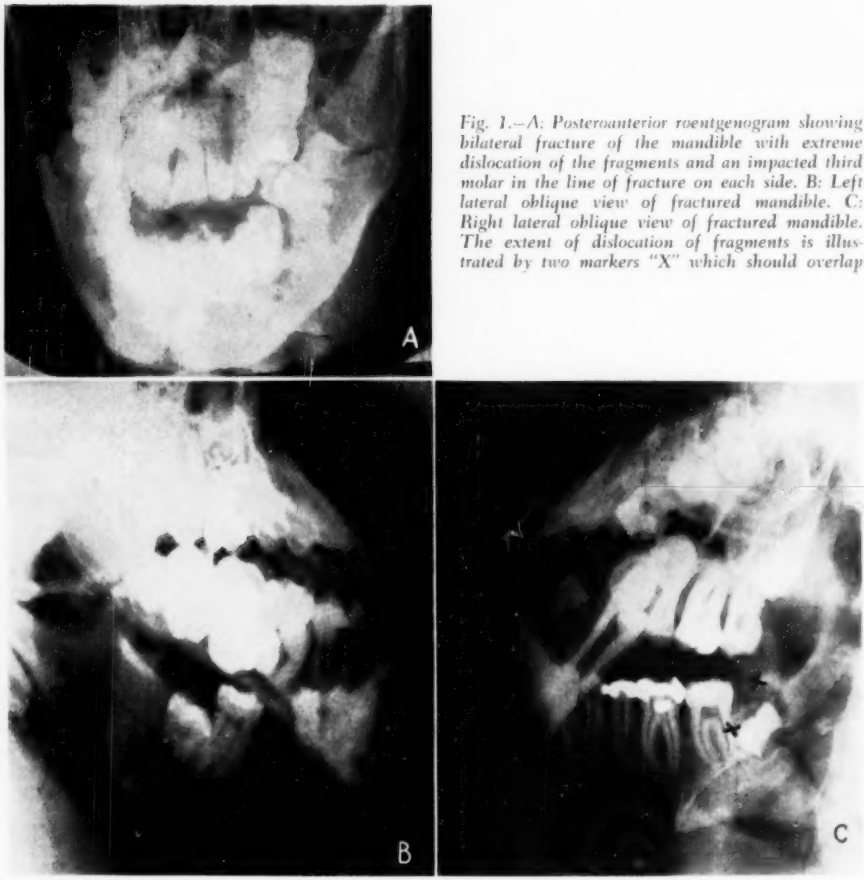


Fig. 1.—A: Posteroanterior roentgenogram showing bilateral fracture of the mandible with extreme dislocation of the fragments and an impacted third molar in the line of fracture on each side. B: Left lateral oblique view of fractured mandible. C: Right lateral oblique view of fractured mandible. The extent of dislocation of fragments is illustrated by two markers "X" which should overlap

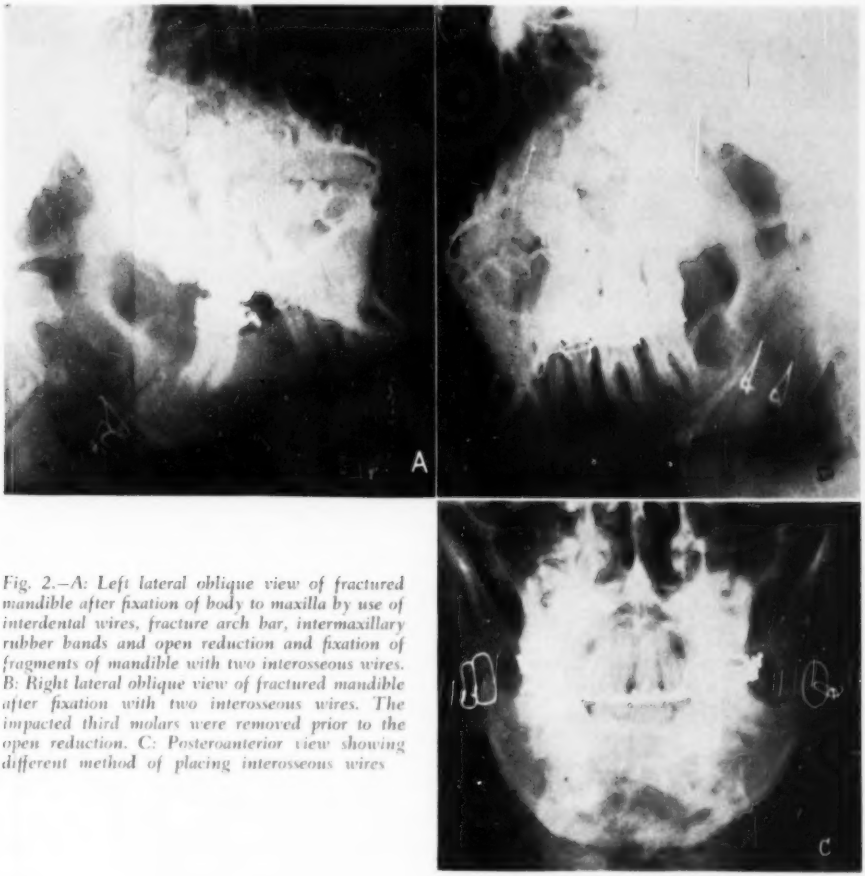


Fig. 2.—A: Left lateral oblique view of fractured mandible after fixation of body to maxilla by use of interdental wires, fracture arch bar, intermaxillary rubber bands and open reduction and fixation of fragments of mandible with two interosseous wires. B: Right lateral oblique view of fractured mandible after fixation with two interosseous wires. The impacted third molars were removed prior to the open reduction. C: Posteroanterior view showing different method of placing interosseous wires

morphine sulfate, 1/150 grain atropine sulfate intramuscularly and 3 grains pentobarbital sodium. He was brought to the dental clinic where 6 eyelets of 26 gage stainless steel were attached to the teeth of the mandible, a fracture arch wire was attached to the teeth of the maxilla and the jaws were fastened into correct occlusion by intermaxillary rubber bands. Fortunately there was a good complement of teeth in both jaws. Nothing was allowed to be taken by mouth until 6 P.M. On September 3, both impacted third molars were removed under regional anesthesia, using intraoral pterygomandibular long buccal and lingual injections of procaine hydrochloride and epinephrine.

Bed rest and sedation then seemed advisable and the sulfonamide and penicillin routine, together with meperidine, 50 mg. every four hours if necessary, was continued. A high caloric liquid diet, supplemented by calcium lactate and vitamin concentrates, was also prescribed. On September 6, after receiving noth-

ing by mouth for six hours, the patient was given ¼ grain morphine sulfate, 1/150 grain atropine sulfate and 3 grains pentobarbital sodium as preparation for open reduction of each fracture. The teeth remained rigidly fixed in centric occlusion during this operation. On the right side, a 10 mm. semilunar incision was made from a point 2 cm. below the tragus of the ear downward, through a point 2 cm. below the angle of the mandible and forward to a point at the lower border of the mandible below the root of the second molar. The underlying platysma, the distal third of the masseter muscle and the mandibular periosteum were incised. The periosteum, portions of the masseter and platysma muscles, together with the tip of the lower lobe of the parotid gland and other structures superficial to the mandible in this region, were retracted upward. Two holes were made in the approximating ends of each fragment of the mandible. The fracture was then reduced and the fragments retained in position by two 26 gage stainless steel interosseous wires (Fig. 2, *A*). The periosteum as well as severed fibers of the platysma and masseter muscles were sutured into position with 000 catgut. Interrupted silk sutures were used to suture the skin. The suture line was then painted with compound tincture of benzoin and a gauze dressing was placed.

The operation on the left side was essentially the same as on the right side with these exceptions: (1) the skin incision was 7 mm. long; (2) one hole was made in the approximating portion of each fragment of the mandible about 1 cm. above its lower border and an interosseous wire (26 gage stainless steel) was placed through these holes; (3) a third hole was made at the fracture line, 5 mm. above the inferior border, in such manner that it passed through the beveled ends of each fragment. The end of the wire that passed through this hole was brought around the lower border to the external surface of the mandible and secured to the other end which had been passed through the loop of the previously placed interosseous wire (Fig. 2, *B*). This prevented overriding of these fragments. (See Figure 2, *C*.)

Alternate skin sutures were removed the second day after the operation and the remaining sutures were removed on the fourth and fifth postoperative days. All gauze dressings were removed from the face and neck on the sixth postoperative day. Interdental wires and intermaxillary rubber bands were removed the fifth postoperative week and the patient had good function and normal occlusion.

Although morphine sulfate is an ideal drug for use in these cases, the proper precautions to prevent vomiting must be carefully observed. In my experience this has not posed a serious problem as no patient has been inconvenienced in this manner. However, the patient is never allowed anything by mouth for six hours prior to or after administration of the drug. If given a drink of water, which they always request, there is a possibility that they will immediately regurgitate it.

■ Burns Resulting from Atomic Bomb Explosion

It is estimated that 34,000 persons received severe burns as a result of the atomic bomb explosion at Hiroshima, Japan. Drs. H. E. Pearse and J. T. Payne in an article entitled "Mechanical and Thermal Injury from the Atomic Bomb," published in the *New England Journal of Medicine*, 1949, estimated that the following personnel and material would be necessary to adequately care for one patient with a 40 per cent "moderate temperature" burn: 3 nurses, 2 physicians, 42 tanks of oxygen, 36 pints of plasma, 40 pints of blood, 104 pints of intravenous fluid, 36,432 yards of gauze, and numerous incidental drugs.

The oral surgeon's obligation

"I HOLD EVERY MAN a debtor to his profession; from the which as men of course do seek to receive countenance and profit so ought they of duty to endeavor themselves by way of amends to be a help and ornament thereunto."—Frances Bacon.

The society which bestows upon us the rights and privilege to practice our profession of oral surgery, also places upon us certain obligations in return. Our chief obligation is to render the best possible service to the public that is possible in the light of our present day dental and medical scientific knowledge. On entering our profession, we assume the obligation of continued study, self-improvement and development and the acquisition of new methods and technics to improve our service to the community at large.

The life blood of any profession is its literature, without which no progress could be made, and its very existence becomes impossible. To appreciate this, we have only to examine the status of the various professions whose literature was so seriously affected by the last war in foreign countries where scientific publication declined to a very low ebb.

It has been said that a man does not stand still; he either progresses or goes backward. This is also true of professional activities, which depend to a very great extent upon whether the scientific efforts of the profession reach the literature.

Each member of a profession should have the moral obligation and the desire to make his profession a better one in which to practice. He can do this only by contributing to the progress of its scientific development and by making contributions to its literature.

It is true that contributions may be made to the scientific progress of a profession by giving clinics and lectures, but unfortunately most of this effort falls upon the ears of only a few. Much of it is not heard, or may be misunderstood, and only an infinitesimal amount of it is retained and much of this is quickly forgotten.

The real contributions are those that are placed upon the printed page to be read and reread by generations of professional men to come.

No man can go through a lifetime of practice in the field of oral surgery without making some new scientific observation. This may be in the form of a diagnostic procedure, a new instrument or surgical technic, or a new method for the management of diseased or injured tissues. It is the obligation, therefore, of this individual to record his observations so that they may appear in print for the benefit of all patients and surgeons, both present and future.

The value of such observations and publication is not limited solely to the oral surgeons of America. These articles will be read and observed by the surgeons of the world who read the JOURNAL OF ORAL SURGERY as it is published, or who read translations and abstracts in their own language.

There is only one journal devoted exclusively to the publication of scientific material in the field of oral surgery. This is the JOURNAL OF ORAL SURGERY which is published by the American Dental Association. It is published with the single thought in mind of bringing to its readers the best material available in the field of oral surgery. The motives of profit, propaganda, or the use of the JOURNAL as an advertising medium, are in no way a consideration. The JOURNAL is published at cost for the benefit of the specialty of oral surgery.

The JOURNAL OF ORAL SURGERY deserves the undivided support of every one of us who dignifies himself with the title of oral surgeon.

The JOURNAL OF ORAL SURGERY is your journal. It is published by your Association for your express benefit. You, as an oral surgeon, have an obligation to your profession of oral surgery and to its literature. May we have your contribution in the form of a short paragraph containing a single idea of interest; in the form of an interesting case report; the description of a new instrument or technics; in the form of a longer scientific article.

HOWARD C. MILLER

MEMBERS OF THE dental profession were grieved to learn of the death of Howard C. Miller on May 18, 1950. Born August 25, 1893, in Grand Island, Nebraska, he was the son of Howard C. Miller, a pioneer dentist of that state. He was graduated with a D.D.S. degree from Creighton University in 1916 and was awarded an honorary LL.D. degree from that institution in 1944. Following two years in the general practice of dentistry in Omaha he enlisted in the Navy in 1918 and served as Lieutenant, senior grade, D.C., at Great Lakes Naval Training Station. In 1920 he located in Chicago and limited his practice to oral surgery.

Although he devoted the last thirty years of his life to his specialty he maintained a keen interest in the affairs of general dentistry. He served as secretary and president of the Chicago Dental Society, trustee of the American Dental Association and regent of the American College of Dentists. He was a past president of both the Chicago Society of Oral Surgeons and the American Society of Oral Surgeons. He was a founder member of the American Board of Oral Surgeons and its first president, a position which he held for the last five years. He was a member of the International College of Anesthetists, Odontographic Society of Chicago, and Delta Sigma Delta and Omicron Kappa Upsilon fraternities. He was the first editor of the oral surgery section of the *Year Book of Dentistry*, and held that position for seven years. He was a staff member of the Grant Hospital and head of the Oral Surgery Department of Henrotin Hospital. As chairman of the committee on journalism of the American Society of Oral Surgeons he was instrumental in effectuating an agreement between that society and the American Dental Association which resulted in the publication of the JOURNAL OF ORAL SURGERY. Dr. Miller was a member of the Episcopalian church.

Dr. Miller believed implicitly that oral surgery should be maintained as a specialty of dentistry, and worked unceasingly toward that end. His interest in advancing the standards of dental education, particularly the standards of oral surgery, his insistence on perfection, his meticulous attention to details, his operative skill and his respect for human tissue plus his sympathetic nature and gracious manner endeared him to his patients and commanded the esteem of his dental and medical associates. He is survived by his wife, Murrel, daughter Marilyn, and brother, Ralph.

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Incisive canal cyst

■ *Joseph L. Bernier, D.D.S., M.S., and Richard W. Tiecke, D.D.S., M.S., Washington, D. C.*

Incisive canal cysts arise from epithelial remnants of the nasopalatine ducts that remain behind following the formation of the anterior palatine structures.[1] These cysts, arising in the incisive canal and within the substance of the maxilla, are slow-growing,[2] and usually painless, for which reason they may go unnoticed for years. A salty tasting discharge from the incisive canal is sometimes noticed.

Roentgenographic examination is important because it helps differentiate it from other cysts occurring in the same general region. The incisive canal cyst is sometimes confused clinically with the cyst of the papilla palatina although the latter occurs at the nasopalatine foramen and usually produces a palatine swelling. A roentgenogram, however, will further resolve this difficulty as the papilla palatina lies outside the alveolar process at the opening of the canals and as a rule does not show in the roentgenogram.

The incisive canal cyst must be differentiated from the radicular cyst so that vital teeth are not needlessly removed. Sometimes it appears that the apexes of the incisor teeth extend into the cystic mass; however, this is seldom the case. Roentgenograms taken at various angles should either confirm this condition or reveal it as being caused by the angulation of the tube.

When both nasopalatine canals are affected a heart shaped radiolucent region may be present in an intraoral roentgenogram of the central incisor teeth. Such an observation is not conclusively diagnostic since the median alveolar cyst may enlarge to involve the same portion and structures. Further the roentgenogram is not always constant because often only one of the two canals may be affected,[3] in which case the radiolucent region is to one side of the midline and is oval or round. When the teeth are absent the cyst tends to be larger and appears nearer the alveolar border.

Histologically the cyst usually has a thick connective tissue membrane, the lining of which may be squamous, ciliated columnar or transitional epithelium. The presence of acini of mucous glands is important in establishing the diagnosis. Inflammation may be present and upon occasion cholesterin crystals are found.[3]

REPORT OF CASE—The patient, a 40 year old white male, requested treatment because of a swelling in the anterior portion of his palate. It had been present for about a year. At times it increased in size, became tender and drained. For about four weeks previously there had been a slight amount of salty tasting fluid draining

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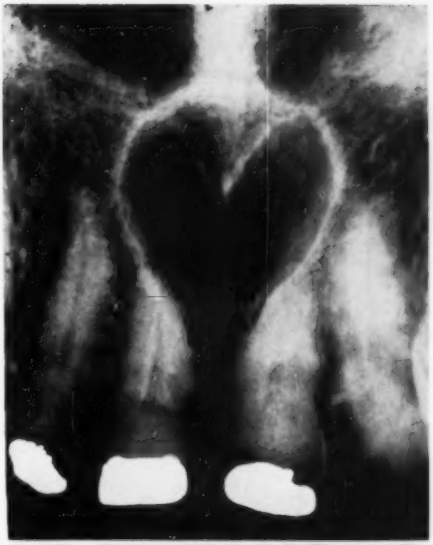

Fig. 1.–This roentgenogram shows the heart shaped lesion which may be found in both median alveolar and incisive canal cysts. The apexes of the central incisors are not involved in the cyst

Fig. 2.–Mucous glands are seen in this section which is diagnostic of an incisive canal cyst. Squamous epithelium is noted here instead of the respiratory type

from the incisive canal. Examination revealed a slightly swollen area in the anterior palate in the region of the incisive canal. Pressure applied to this site resulted in a thin mucous-like fluid being expressed from the opening of the canal. The patient experienced little or no pain. A roentgenogram revealed the heart shaped lesion between the central incisors without involvement of the roots of either tooth (Fig. 1).

TREATMENT—Under local anesthesia a flap was made on the lingual aspect, the borders of which extended from the distal embrasure of the lateral incisors to the mesial of the second bicuspids. This flap was elevated and the cyst partially exposed. A parchment-like bone near the edges was removed and the cyst enucleated with care to avoid injury to the nasopalatine nerves and vessels. The wound was treated with penicillin and sulfathiazole and the flap was sutured into place. Recovery was uneventful after a minimal amount of postoperative swelling and pain.

GROSS FINDINGS—The gross specimen appeared as a fibrous saclike structure and contained a remaining small amount of purulent fluid.

MICROSCOPIC—Sections of the cyst walls show a fibrous connective tissue lined with both squamous and respiratory type epithelium. Mucous glandular acini (Fig. 2) were present in the walls which served to differentiate this cyst from the median alveolar type. There were scattered chronic inflammatory elements consisting mainly of lymphocytes and a few plasma cells.

Fibrous dysplasia

■ *Joseph L. Bernier, D.D.S., M.S., and Richard W. Tiecke, D.D.S., M.S., Washington, D. C.*

Fibrous dysplasia has been described in two forms; the monostotic type in which single bones are affected and the polyostotic type in which several bones are involved.[1] Histologically the lesions are often identical with the ossifying fibroma[2] which is considered by some investigators to be a variant of fibrous dysplasia.[3] In 1942 Jaffe and Lichtenstein reviewed 75 cases[4, 5, 6] and added 15 of their own.[7] In 1946 Schlumberger[3] added 67 more cases to the literature from the material in files of the Armed Forces Institute of Pathology. These included two from the mandible and seven from the maxilla.

Fibrous dysplasia is dominant in the female and is usually found in the second and third decades of life. When it is present in young children it may assume a serious form, many bones of the skeleton being involved. Since there is usually no pain, the patient seldom seeks treatment until deformity or pathologic fracture occurs.

According to some investigators the etiology of this disease is a congenital anomaly in development.[8] The skeletal lesions apparently result from a distorted activity of specific bone forming mesenchyme and produce a focus or foci of involvement in one or more bones. Ac-

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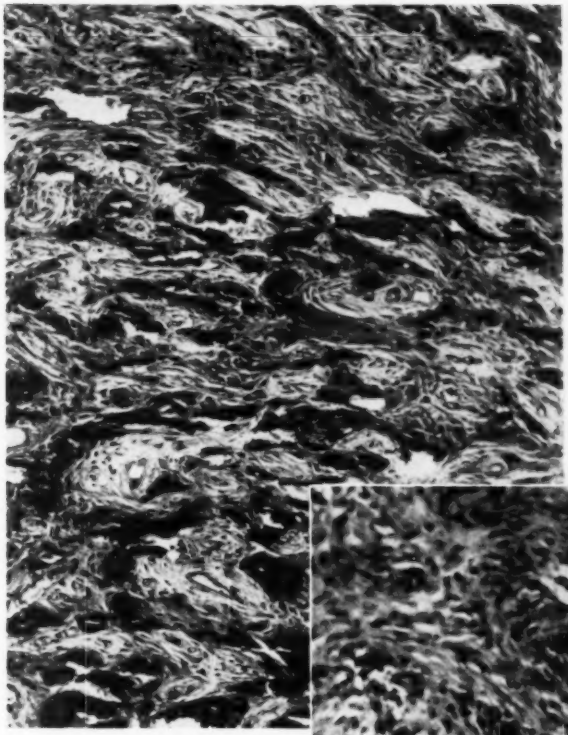

Fig. 1.—The dense fibrous connective tissue forms the major part of this tumor. Beginning bone formation is seen in varying degrees

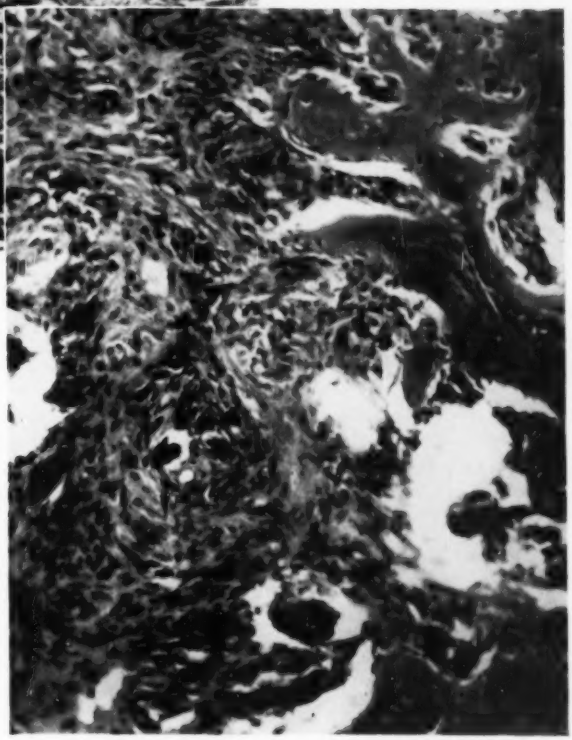

Fig. 2.—A higher power of Figure 1. Note areas of calcification

cording to some investigators the individual bone lesion may in a sense be conceived as a hamartoma.

The affected bone may be expanded throughout although if such is not the case the cortex in the region in which the lesion is located shows erosion and thinning from the medullary side. The bone marrow of the involved region is replaced for the most part with a potentially osteogenic fibrous connective tissue. Newly formed trabeculae, collagenous areas, and cartilage may be present. Small secondary cysts may be found as a result of focal degeneration.

As described by Albright,[5] extraskeletal conditions may appear, such as pigmentation of the skin, endocrine dysfunction and premature skeletal growth and maturation. Cardiovascular and renal abnormalities may also be present.

Of the mandible and maxilla, the latter appears to be the more common site. Occasionally both jaws are affected. The prognosis is favorable unless adjacent vital tissue becomes involved or unless the jaw is only one of a great number of bones involved. There have been no reports of malignant change. Growth is slow and is not circumscribed so that recurrence is a likely possibility.

REPORT OF CASE—A 42 year old white male had one tooth removed from the left side of the mandible in January of 1947. Three months later another tooth was removed from the same region. Both alveoli failed to heal properly and roentgenograms revealed a possible radicular cyst. On May 19, 1947, multiple irregular pieces of fibrous tumor tissue were removed from the cystic cavity in the left mandible. Microscopic examination resulted in a diagnosis of ossifying fibroma. The patient was discharged after minor surgical intervention.

On January 19, 1949, he was admitted to the hospital with a clinical diagnosis of ameloblastoma.

The chief complaint was gradual enlargement of the left mandible with discomfort but no pain. Multiple, fibrous, irregular pieces of tumor were again removed and a microscopic diagnosis of fibrous dysplasia made.

The patient was not seen again until December of 1949, when he reported to Walter Reed General Hospital. The chief complaint at this time was again discomfort resulting from enlargement of the left mandible, principally on the lingual and inferior borders. One shotty node was palpable high in the left neck. Roentgenograms disclosed a multilocular cystic mass in the left mandible extending from the region of the mental foramen to the angle. The buccal and inferior borders appeared normal and no erosion of the cortex was noticed.

On January 6, 1950, the bulk of the body of the left mandible was resected. The tissue was examined microscopically and a diagnosis of fibrous dysplasia was again made. The patient's postoperative course was uneventful and he was discharged on January 17, 1950.

GROSS FEATURES—The specimen consisted of approximately 8 grams of fragments of bony and fibrous tissue of firm consistency. The individual fragments varied in size, form and shape, the largest being 1.5 by 1 by 1 cm.

MICROSCOPIC—There were strands and whorls of dense connective tissue which at many points appeared separated while in other areas compactly placed. Scattered throughout the substance of the tissue there were numerous bone spicules showing varying degrees of osteogenesis (Fig. 1). In the older zones there was partial calcification of these spicules, which were surrounded by closely applied osteoblasts. The newer spicules were further characterized by a pale eosinophilic border of osteoid tissue. Surrounding the primary layer of osteoblasts were cellular extensions into the adjacent fibrous tissue undergoing a gradual transformation to a fibrous type of connective tissue. The osteoblasts were loosely connected to each other and in some zones the osteoid tissue appeared in an interlacing or interconnecting form (Fig. 2).

Scattered throughout the section there were numerous multinucleated giant cells. These giant cells were moderate in size, being as a rule approximately five to six times the size of the lymphocytes and each containing from two to six nuclei.

Adeno-ameloblastoma

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The ameloblastoma is derived from the epithelial portion of the tooth follicle, the cellular morphology suggesting origin from cells having differentiated to resemble the inner enamel epithelium.[1] Enamel is not formed, however, since the delicate balance between the inner enamel epithelium and the adjacent mesenchymal cells, which is necessary for the production of enamel, is not achieved.

This tumor may result from developmental disturbances affecting the follicle or may arise directly from epithelial cell nests from the epithelium of odontogenic cysts and on occasion from surface epithelium.[2] Tumors simulating the ameloblastoma have been reported in other parts of the body which seems to indicate that tissues other than those in the enamel organ may exhibit odontogenic potentials.

The ameloblastoma is more common in the mandible and occurs in males more often than in females. The age incidence varies considerably but the average is approximately 30 years of age. Favorite locations are the molar region, the ramus and symphysis.

An important feature of the ameloblastoma is that it is an expansile rather than an invading lesion. Because of this feature together with its cellular morphology and the fact that cases with metastasis are exceedingly rare (no such cases are contained in the Registry file) it is considered benign. References to metastasis appear in the literature. However, there is apparently reason to question the diagnosis of the primary tumor in most, if not all, instances. Some investigators feel that the tumor may be locally invasive, thus accounting for recurrence when removal is not by a wide margin.[3] It is their belief that the epithelium may penetrate the capsule and thus account for subsequent recurrence. This, however, is questionable, since in the examination of several hundred lesions at the Armed Forces Institute of Pathology in many of which the capsule was penetrated, local invasion has not been present. Metaplasia of the epithelium toward the squamous type with the occasional production of keratin has been observed, but this is not, in our opinion, sufficient evidence to consider ameloblastoma as a malignant tumor.

Recurrence is always a strong possibility and particularly so in cases where the tumor has reached a size where complete removal is difficult. For this reason early diagnosis and surgical removal is desirable, since then the tumor is apt to be small.

Gottlieb and Agnew[4] reported that enamel formation was observed in a number of cases studied by them. In their opinion there were areas in which a distinct prism differentiation as well as a stratum intermedium could be seen. They also reported that poorly calcified bone was present. Review of some of their cases at the Armed Forces Institute of Pathology did not, in our opinion, substantiate this claim. The tumor is usually considered to be a central tumor in spite of the fact that an occasional one occurs peripherally. Robinson[5] has reviewed peripheral ameloblastomas without involvement of the bone.

The structure of the ameloblastoma varies in that it may be monocystic, polycystic or solid. This is apparently directly referable to the age and growth pattern of the lesion. Variations in the epithelium make it possible to recognize several histologic types such as the acanthomatous and adenoid. A case of this latter type is presented in this report. In addition pigment

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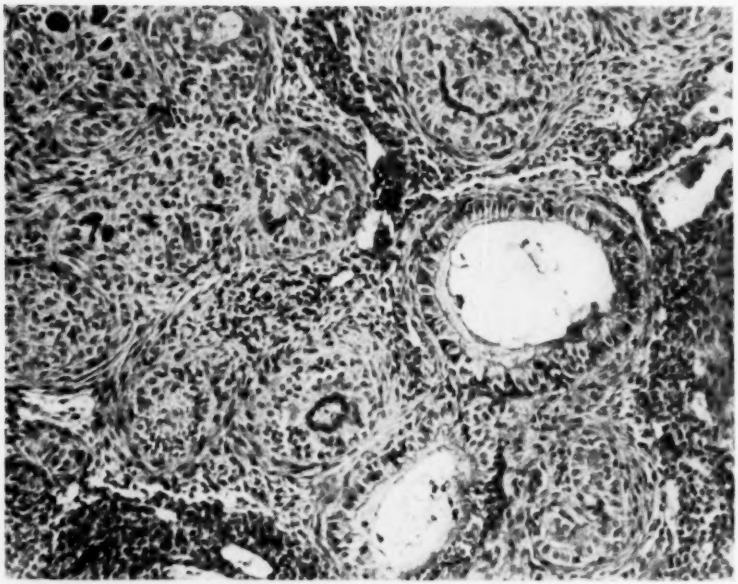


Fig. 1.—Note the cellular character of the tumor and the adenoid configuration. In the upper left hand corner are small foci of calcification. Some of the ducts have no lumen, while others have a lumen containing debris

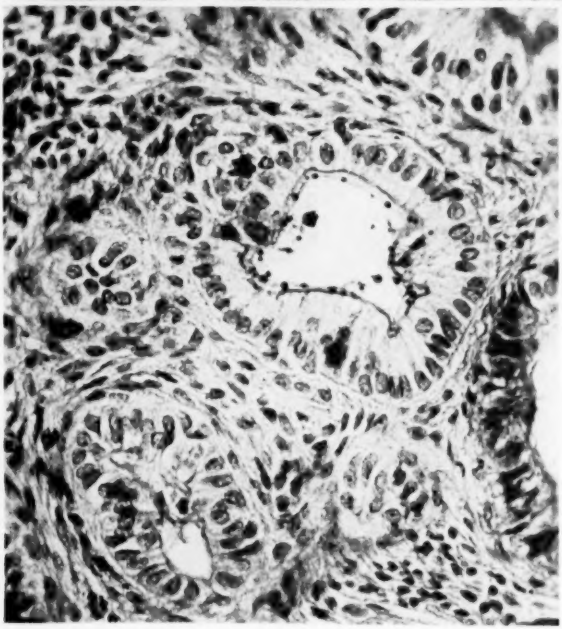


Fig. 2.—This is an excellent example of the columnar epithelium lining the duct-like spaces. Note the uniform cell morphology and staining property

(melanin) may be found in the epithelial cells and on occasion there may be a prominent angiomatous feature. Cahn[6] has emphasized the role of the follicular (dentigerous) cyst as a source of the ameloblastoma.

Usually no subjective symptoms are present other than a mild discomfort owing to the size of the tumor. Secondary infection may, however, cause the lesion to be painful. Some authors report a definite history of pain,[1] which, however, is not considered to be an inherent quality of the tumor.

REPORT OF CASE—The patient, a 13 year old white male, was admitted to the hospital with deformity at the symphysis of the mandible, a condition which had been present for about four months. The symphysis bulged on both the lingual and labial surfaces to a width of approximately one inch. The "tumor" was firm and covered with mucous membrane. The lower right central incisor was missing. Roentgenograms revealed a rarefied region about 1½ inches in diameter, which appeared to be associated with an unerupted lower right central incisor. The tooth was located deep in the left side of the lesion.

A clinical diagnosis of dentigerous cyst was made.

TREATMENT—Under local anesthesia the mucosa was elevated and the labial plate of bone removed. The lesion along with the unerupted tooth was enucleated and the region carefully curetted. During the surgical procedure the roots of three adjacent incisors were exposed making it necessary to remove them. The wound was then treated with sulfathiazole powder and penicillin, a gauze drain was placed and the flaps were sutured to place. The postoperative course was uneventful.

GROSS OBSERVATIONS—The tumor consisted of a cystic mass measuring 2.6 cm. in diameter. The outer surface appeared slightly roughened and bluish in color. A tooth was partially embedded in the wall of the tumor with the crown near the liquefied center of the cyst cavity and the remainder of the tooth, approximately half of it, protruded at a right angle through the outer surface. The tooth itself showed slight resorption and blunting of the root.

The cyst wall measured 3 mm. in thickness and consisted of two layers, each approximately equal in width. The outer layer was a pale yellow while the inner layer, which lined the cyst, was a gray white, finely granular, friable tissue. The cyst cavity contained 9 to 10 cc. of blood tinged fluid.

HISTOLOGY—There was a loosely arranged fibrous connective tissue capsule showing considerable edema and hemorrhagic exudate. The connective tissue showed considerable collagen deposition. The tumor was cellular, the epithelium exhibiting a prominent adenoid configuration (Fig. 1). There were many duct-like structures most of which were lined by columnar epithelium (Fig. 2). The intermediate area was reminiscent of the stellate character seen in the ectodermal portion of the tooth bud.

There was an obvious uniformity of cell morphology and staining property so that malignancy was not suspected.

Vascularity was not a prominent feature and small foci of calcification were noted throughout the section (Fig. 1).

There were some irregular collections of epithelial cells, which appeared to be the precursor of the duct-like structures. Some of these cell groups were surrounded by a pink staining osteoid-like material which showed no calcification.

CONCLUSION—An example of an adeno-ameloblastoma is presented in this case report. The tumor was benign and represents only a histologic variation of the ameloblastoma.

6. Cahn, Lester R., The Dentigerous Cyst as a Potential Adamantinoma, *D. Cosmos* 75:889, 1933.

■ Treatment for Hyperplastic Tissue

Q.—What treatment is advisable for hyperplastic tissue under an ill-fitting denture?

A.—The clinical picture of acute and chronic inflammatory change should first be simplified by removing the denture for a week or two. The residual hyperplastic tissue excess then may be excised accurately with a minimum of distortion, bleeding, infection and scar. Such tissue always should be submitted for pathologic diagnosis. Following complete healing, the new prosthesis is constructed with proper adaptation and balanced intermaxillary relations.

■ Facial Swelling from Odontogenic Infection

Q.—Are cold applications advisable in treating facial swelling from odontogenic infection?

A.—No. In an attempt to localize or resolve such processes, hydrotherapy employing heat is beneficial in increasing circulation and defense mechanisms in the affected part.

■ Anesthesia of the Maxillary Molars

Q.—How may consistently profound anesthesia of the maxillary second and third molars be accomplished?

A.—Failures in block anesthesia of the posterior superior alveolar nerves result chiefly from anatomic variations of that region. The contours of the tuberosity and infratemporal surface of the maxilla may vary widely and may prevent effective deposition of the anesthetic solution. By first palpating these landmarks and then curving the needle by stroking it in a sterile sponge to conform to the degree of tuberosity convexity, it is possible to inject at the buccinator muscle reflection and keep the needle close to bone in its entire path to the level of the foramens. This will not only provide efficient and profound anesthesia but will prevent the complications of hematoma from vascular injuries.

■ Precautions for the Diabetic Patient

Q.—What precautions should be taken for the patient who states that he is a diabetic?

A.—It should be first established that his diabetes mellitus is under satisfactory medical control. Odontogenic infection, as well as all infections, throws diabetics out of insulin control and careful cooperation with the internist is frequently necessary to determine the opportune time for the required surgery. Since diabetics have a notoriously poor resistance to infection, they should be given the advantage of protective blood levels with antibiotics before surgery.

■ Ecchymosis as a Sequel to Minor Oral Surgery

Q.—How may ecchymosis be minimized as a sequel to minor oral surgery?

A.—The careful handling of tissue, avoiding excessive flap reflection, controlling bleeding from bone after alveolar trimming, meticulous débridement and careful closure are all significant aids to hemostasis. Sutures should not close flaps tightly since submucosal bleeding and confined edema will then amplify complications. Following the completion of surgery and before the final insertion of immediate dentures, it is

advisable to wait ten to fifteen minutes to be certain of adequate hemostasis. Postoperative application of cold to the site at half hour intervals produces vasoconstriction to also minimize ecchymosis as a sequel to minor oral surgery.

■ EVALUATION OF POSTOPERATIVE SWELLING

Q.—When a patient returns 48 hours after surgery, how is the swelling evaluated to differentiate traumatic edema from infection?

A.—A check of body temperature and a white blood cell count will readily determine whether or not infection is the basis for the swelling. Traumatic edema is usually subsiding after 48 hours while infection swelling is usually increasing.

■ THE PATIENT WITH ANGINA PECTORIS

Q.—Is the patient with a history of angina pectoris a safe risk for routine oral surgery?

A.—The dangers of precipitating attacks of angina pectoris under the stresses of minor oral surgery are great. These patients must be put at ease, premedicated with appropriate barbiturates, and the local anesthetic used should be without vasoconstrictor content. Using conductive anesthesia the operation should be planned not to exceed ten minutes. Longer periods of operation are unsatisfactory since there is no maintenance of the local anesthesia. Common emergency agents should be at hand for reducing blood pressure and alleviating angina attacks. Inhalation of amyl nitrate or holding a 1/100 grain tablet of nitroglycerin under the tongue are commonly employed for this use.

■ TERAPEUTICA ANTIBIOTICA CON TIROTRICINA. (ANTIBIOTIC THERAPEUTICS WITH TYROTHRICIN). 76 pages. Buenos Aires: Publication of the Department of Scientific Research of the Instituto Massone, 1949.

This booklet prepared by the Science Department of the Instituto Massone, chemical manufacturers and distributors of Buenos Aires, presents a résumé of data so far published on the use of tyrothricin as a therapeutic agent. Clinical work done in Argentina, Brazil, Costa Rica, the United States, France, England, Italy and Madagascar is included.

It is pointed out in the introduction to this volume that this antibiotic substance, about which information was first published in 1939 by its discoverer Rene Dubos, of the Rockefeller Institute, New York, has proved singularly successful in the field of materia medica. Evidence of its efficacy is found in the continued and increased use of this agent despite the availability of penicillin and the sulfonamide drugs. Experiments have proved it to be completely harmless when applied locally to skin and mucous membranes even in considerably higher concentrations than necessary for therapeutic purposes. Its hemolytic qualities, however, contraindicate its use by injection. It is explained that in all cases herein reported a solution of tyrothricin in alcohol, to be diluted at time of use, was employed, and that a more stable preparation with a dispersing agent as base might be expected to give even better results.

Case reports are given in these general categories: digestive tract; respiratory tract; surgery; dermatology—with special report on the treatment of ulcers of leprosy; epidemiology; gynecology; urology; and ophthalmology.

In the latter section, warning is given of chemical meningitis caused by penetration of the antibiotic into the subarachnoid space following radical surgical intervention in cases of sinusitis. Use of tyrothricin should be avoided where there is suspicion of opening in the dura mater; routine and indiscriminate use of the substance to irrigate cavities near the subarachnoid space should not be practiced.

Cases in which tyrothricin has been employed in oral surgery and pathology are reviewed in the final section of the book. An introductory paragraph outlines the technics and results of research on the use of this substance in dentistry, concluding: "On the basis of these studies use of tyrothricin is entirely justified in prevention and treatment of dental and oral diseases. Such use has been substantiated by the work of numerous writers: Smith, 1944; Fechtner, 1944; Johnson, 1943; Kolmer, 1948. Kolmer advises the local use of tyrothricin in apical granulomas, dry socket, gingivitis, periodontal diseases, postextraction infection, pulpitis and stomatitis."

There is a bibliography of 80 entries from medical and dental world literature, and a classified table of contents.—*Martha Ann Mann.*

■ A SURGEON'S GUIDE TO LOCAL ANESTHESIA —A MANUAL OF SHOCKLESS SURGERY. C. E. Corlette. 355 pages, 200 original illustrations and an index. Price $8.50. Baltimore: The Williams and Wilkins Company, 1948.

This book is truly a guide to local anesthesia. It's 25 chapters, 200 original illustrations and index is a manual of shockless surgery.

It deals primarily with the technics for the administration of local anesthesia for every type of surgical procedure. There are illustrations showing the anatomic relationship of the region and the proper technic for making each injection of the anesthetic solution.

The first eight chapters describe the preparation of the patient and the anesthetic solution. Two chapters describe the anatomy of the nervous system and the degree of sensitivity of the various regions of the body. The remaining chapters deal exclusively with the technic involved for making each specific injection for

different regions of the body. Alcohol injections are discussed as to technic of administration and the indication for the various regions.

The author's earlier chapters review for the reader some historical notes on local anesthesia. Some very interesting statistics made by the comparison of procaine, or ethocaine as the author terms it, with other anesthetic drugs and common errors in preparation of the anesthetic solution are revealed.

The chapter dealing with the preparation of the patient is most revealing. The author gives a table of premedication using morphine sulfate and scopolamine in rather unusal dosage combinations. Preparation of the anesthetic solution, the armamentarium and injection technic are discussed very carefully and thoroughly by the author.

One chapter is devoted to a discussion of the various injections about the scalp, temple and face, in which maxillary and mandibular blocks are included. Alcohol blocks for this region are also discussed.

The remainder of the book is devoted to describing the technic for obtaining anesthesia throughout the body for all types of surgical procedures.

This book is well written in a style that is comprehensible to the surgeon as well as the anesthesiologist.—*Joseph E. Schaefer and O. Kenneth Johnson.*

■ Cancer of the Head and Neck. Hayes Martin. 76 pages. Chicago: R. R. Donnelley & Sons, 1949.

In reviewing *Cancer of the Head and Neck*, it seems proper to make brief reference to the book *Mouth Cancer and the Dentist* by the same author. These books are brief monographs. The are admirably prepared, and their dominant theme is the early clinical recognition of cancers of the mouth, and of the head and neck. Both books contain many colored illustrations of high fidelity.

On page 62 in *Mouth Cancer and the Dentist*, the author states, "In former years no papers dealing with mouth cancer were presented before national, state, and local dental meetings. Such an omission may be attributed both to the lack of the realization of the importance of the subject to the dentist and the fact that the medical profession had not actively sought the collaboration of the dental profession. This era of lethargy and indifference has passed." A provocative table appears in the same book on page 10, which points out that in a series of about 200 cases dentists missed 56 per cent of malignant lesions of the mouth they had had an opportunity to observe. This information should stimulate all dentists to meticulous care in mouth examinations. One might speculate as to whether this table would have been more informative had it included all cases of cancer missed, irrespective of who made the examination. It seems that similar statistics might have been effective had they been included in *Cancer of the Head and Neck*.

All of the cancers described and discussed in *Cancer of the Head and Neck* are well within the areas which should properly be included in a careful dental diagnosis. If the dental profession is to assume that which is clearly its obligation, each dentist must be informed, and be constantly alert to discover any lesion within his field which is or may be cancerous. It seems that every practicing dentist should be thoroughly familiar with the material contained in both of these books.—*Warren R. Schram.*

■ Plastic Surgery in the United States: A Review of the 1948 Literature. G. S. Letterman and W. C. Meloy. Arch. Surg. 60: 583, March, 1950.

This is a review of papers on plastic surgery published in the United States during 1948. It provides a brief and fairly comprehensive survey of articles from local, county and state publications which are of limited geographic and numerical circulation and includes those papers appearing in the more widely distributed surgical journals. The subjects reported on, in many instances, involve situations and procedures encountered by the oral surgeon. The articles are classified under these subject-categories: cleft lip and cleft palate; facial injuries and repairs; mandible; facial paralysis; scalp and cranioplasty; scars and keloids; hemangioma; skin grafting; composite graft; cartilage; chronic ulcers of the skin; ears; eyelids and orbit; nose; upper extremity; lower extremity; mammoplasty; genitalia; anesthesia, and miscellaneous topics. The review included a complete bibliography.

■ The Evaluation of Xylocaine as a New Local Anesthetic. Matthew Lozier. Oral Surg., Oral Med. and Oral Path. 2:1460, November, 1949.

Xylocaine was introduced in 1946 by Löfgren and Lundquist of Sweden. It is not related chemically to the alkaloid cocaine. Numerous clinical investigations have been carried out in Sweden to discover the properties of Xylocaine as compared to Novocain. Goldberg experimented with animals to determine the properties of Xylocaine. Björn and Huldt conducted a lengthy series of experiments to determine the efficiency of Xylocaine as a dental anesthetic. Bremer, Persson, Ekmanner and Strandberg conducted a lengthy clinical investigation of Xylocaine in the practice of oral surgery, exodontia and pulp extirpation. The findings of these investigators were essentially the same:

1. Xylocaine may be used with or without Adrenalin, but its combination greatly increases the effectiveness of the anesthetic.
2. Xylocaine will not decompose with heat.
3. A neutral or acid Xylocaine-Adrenalin solution made no difference.
4. The onset of anesthesia with Xylocaine is slightly quicker than with Novocain.
5. The anesthetized area is greater with Xylocaine than with Novocain when injected under the same conditions.
6. The cases of adequate anesthesia were much higher with Xylocaine.
7. The anesthetic duration of Xylocaine is much longer than is Novocain.
8. Anesthesia can be obtained by infiltration rather than block in the anterior part of the mandible.
9. In infection, anesthesia with Xylocaine is about four times more effective in comparison to Novocain (reported only in animals).
10. Xylocaine can be used as a surface anesthetic successfully.
11. Xylocaine will show less undesirable side reactions than will Novocain (faintness, collapse, and so forth).

T. Gordh made observations on patients hospitalized for general surgery and found no unexpected reactions in any patients when Xylocaine was employed, regardless of how the anesthetic was used. His findings correspond with those listed above. It has a more marked affinity for sensory nerves and less for motor nerves. It shows decidedly nontoxic reactions even in patients sensitized to Novocain and Pontocaine. Gordh states that Xylocaine "well fulfills the standard requirements for an ideal local anesthetic. It has low toxicity, does not irritate the tissue, is soluble in water, sterilizable and permits the addition of Adrenalin."

It has long been recognized that Novocain-Adrenalin does not possess adequate po-

tency and duration. Patients have frequently experienced pain and discomfort during an operation in which it was employed. Xylocaine may well be the answer to this for it will produce adequate anesthesia in places where everything else has failed. It has a moderately prolonged postoperative anesthesia period. Its action does not give too profound an anesthesia and it does not cause dermatitis as Novocain occasionally will do. The introduction of Xylocaine is an advance in the science and practice of local anesthesia.—*J. K. Paul.*

■ THE REPAIR OF THE BILATERAL CLEFT LIP. Wm. C. Huffman and D. M. Lierle. Plast. and Reconstruct. Surg. 4:489, November, 1949.

After using a one-stage procedure for closure of complicated bilateral clefts of the lip Huffman and Lierle have coordinated a three-stage procedure which has produced better cosmetic results than the former procedure. The various technics utilized in the sequence are not original with the authors but are modified and correlated, in part, to provide a surgical plan more capable of facilitating normal facial development, according to them.

Stage 1—An incision is made along the free edge of the nasal septum and the mucoperiosteal flaps are reflected, laterally. At a point 1 to 1.5 cm. distal to the premaxilla a vertical section of the nasal septum is removed to allow the premaxilla to be retroplaced into normal position without tilting. Flaps of the lateral aspects of the premaxillary mucoperiosteum, hinged anteriorly, are approximated to bilateral flaps from the contiguous alveolar clefts of the maxillae which are hinged posteriorly. These close the maxillary aspects of the clefts in the labial vestibule; the bilateral vomer flaps are sutured into the respective palatal flaps after the method of Dorrance and Bransfield. Thus, the premaxilla is fixed in place.

From two to eight weeks should elapse before the next stage is done. In this time the "redraping" of the tissues may allow lengthening of the columella and some reduction in the flatness of the nasal tip.

Stage 2—The object of this stage is to convert a bilateral cleft into a unilateral one.

The lip, ala and cheek are widely undermined on one side to permit easy adaptation of the ala into proper position. When this is accomplished the authors treat the lip on that side as described in the procedure by Brown and McDowell, because of the conservation of lip tissue this method embodies. However, any of the standard procedures for correction of a unilateral cleft of the lip may be employed.

Four to eight weeks is allowed for maximum enlargement and reshaping of the prolabium to occur under the stimulation of the muscular pull and daily massage.

Stage 3—This stage is primarily repetition of Stage 2 done on the opposite side, but it is usually less difficult.

The authors have produced better results by this sequence of surgical procedure than by the use of the one-stage method. The columella develops to a more normal length without the broad nasal tip and without the tight, long, bound-down lip usually seen with the other procedures.—*L. E. McKelvey.*

■ THE USE OF REMOVABLE ACRYLIC PROSTHESIS TO RETAIN MANDIBULAR FRAGMENTS AND ADJACENT SOFT TISSUES IN NORMAL POSITION AFTER SURGICAL RESECTION. Grant E. Ward, Riley S. Williamson, Jr., and John O. Robben. Plast. and Reconstruct. Surg. 4: 537, November, 1949.

The authors state that following resection of large portions of the mandible in certain diseases such as osteomyelitis, benign tumors, malignant tumors and other rare diseases it is not possible to reconstruct the mandible immediately by the use of bone grafts. It is advisable to wait at least six months to a year before attempting reconstruction to assure against recurrence. Removal of a portion of the mandible allows shifting of the remaining fragments in the direction of the muscle pull. Postoperative scar is likely to be extensive in the face of infection or following irradiation of the floor of the mouth, causing severe displacement of the

remaining fragments of bone, making it difficult later to perform bone graft procedures.

The authors report a case in which a large adamantinoma of the solid type necessitated reconstruction of the entire body of the mandible as far back on each side as the second molars; only the third molar teeth remained. The operation was carried out entirely through the mouth without external incisions. A prosthesis was immediately inserted into the raw areas left by extensive loss of mucous membrane and bone. It was attached to the teeth by means of wire clasps. The prosthesis was allowed to remain in place for a period of six months. This gave good contour and support to the soft parts and permitted the patient to masticate food. When the prosthesis was removed the floor of the mouth was normal, soft and pliable. The patient has used the appliance for three years and is now ready for bone grafting procedures.

■ MORPHINE "SENSITIVITY." William T. Salter and Mary Louise White. Anesthesiology 10:553, September, 1949.

The authors' purpose is to clarify certain issues and pose certain problems which have been raised regarding the "sensitivity" to morphine as used in preliminary sedation and basal anesthesia. "Sensitivity" has been used loosely in this regard and serves to confuse the issue.

"Sensitivity" may mean a true allergic reaction to the drug. Such an allergy has long been recognized. It is a common occurrence in large hospitals for personnel preparing hypodermic medication to develop eczema of the hands. Parenteral administration of morphine to such an individual is equivalent to the injection of an antigen. Consequently symptoms of acute allergy may develop, ranging from syncope to anaphylastic shock. True idiosyncrasy is unmistakable because the patient's blood pressure becomes extremely low and he exhibits profound collapse. Urticaria and itching of the nose appear in patients showing a frank allergy.

A second type of "sensitivity" is profound depression. Notable among these patients are those afflicted with hypothyroidism and Addison's disease. Both diseases produce a lowered metabolism.

A third type of "sensitivity" is the excessive reactivity due to causes not yet ascertainable.

The average dose of morphine given to a person at random might provide only half the needed medication, while the same dose given to another might provide twice the required amount. This problem pertains to practically all drugs.

Another phenomena known as "sensitivity" is the maniacal reaction characteristically seen in cats and in some women. The highly neurotic patient sometimes reacts with restlessness and confusion. Occasionally when morphine is administered to a patient with a high fever, delirium results.

Another "sensitivity" is vomiting. However this is best considered as an untoward reaction or side effect. In part the emetic effect is due to the apomorphine especially precipitated by sudden change in position.

In certain individuals, especially children, a reddened cord of lymphangitis extending up the arm may persist for a number of hours after injection.

Another so-called "sensitivity" is due to the synergistic effect produced when some other basal anesthetic agent is used simultaneously. A profound depression may ensue.

At the extremes of life, one finds increased reactivity to morphine. This is also true of patients who have suffered emaciation and cachexia from prolonged diseases.

The appearance of nausea and vomiting in patients receiving morphine on surgical services as a preliminary to operation appears to be greater than in patients suffering from ordinary diseases. Substituting codeine or isonipecaine for morphine reduces the incidence of nausea and vomiting. When morphine is really needed it is best given in small repeated doses with synergistic cortical depressants like scopolamine. Nausea is rarely produced with doses under ⅛ grain.

The term "sensitivity" should be restricted to the allergic phenomena. Other untoward effects should be identified by clearly identified descriptive terms. The emetic effect of mor-

phine can often be avoided by a small preliminary dose of the drug. When possible, codeine and isonipecaine should be substituted and advantage taken of synergistic depressant drugs.—*W. H. Justi.*

■ TRIGEMINAL INJECTION WITH RADIOGRAPHIC CONTROL. W. H. Sweet. J.A.M.A. 142:392, February 11, 1950.

For a large group of patients with pain referable to the face, interruption of the nervous pathway from the painful area appears to be the best available therapy. Although in numerous publications many technics are described for achieving block of the trigeminal branches, most authors neglect to mention the frequency with which they attain their objective. In an effort to make the injection less of a trial, the author began to take roentgenograms showing the position of the needle point with respect to the foramen ovale. Methods for the injection of alcohol into the second and third divisions of the trigeminal nerve, involving roentgenograms to ascertain the position of the needle, are described. The advantages of these methods are: the pain of the procedure is decreased; the number of complete injections into the nerve is increased to more than 95 per cent of those attempted; the average duration of relief from pain of trigeminal neuralgia following injections into the third division is increased to at least 30 months.

■ A MORTISED MANDIBULAR BONE GRAFT FOLLOWING GIANT CELL TUMOR REMOVAL. Claire L. Straith. Plast. and Reconstruct. Surg. 4:282, May, 1949.

The giant cell tumor is locally destructive and invasive but does not metastasize and seldom kills the patient. It is more common in children and young adults, most always before the age of 30. It occurs most often near the end of the long bones but may occur in any bone developed from cartilage. In the mandible the tumor occurs in those portions derived from cartilage —either in the symphysis or in the ramus where there is a separate center of ossification. The tumor has a characteristic roentgenographic appearance, being multicystic, or trabeculated appearance as if the mass is composed of bubbles. It must be differentiated from adamantinoma. Its gross appearance is that of a soft, dark red, hemorrhagic mass, sometimes showing yellow areas. It has a thin fibrous capsule. Microscopically it is characterized by numerous large giant cells, 25 to 30 may be seen in a low power field.

Bloodgood, in 1910, pointed out the benign character of this lesion and since that time the treatment has been conservative, consisting of curettement and roentgen therapy, or roentgen therapy alone. The author reports a case in which curettement plus roentgen therapy was used, this was followed by a bone graft which has been in place for 25 years. The author points out that this graft took in its entirety in spite of preoperative roentgen treatment of the tumor. The graft was obtained from the iliac crest and was mortised into the remainder of the ascending ramus and the body of the mandible. The graft was 3 inches long, ¾ inch wide, and ¼ inch thick. The patient, after 21 years, has excellent function and roentgenograms verify the position of the graft.

■ PRIMARY REPAIR OF SEVERED PAROTID DUCT. Robert S. Sparkman. Ann. Surg. 129: 652, 1949.

The author discusses the repair of the severed parotid duct over a ureteral catheter, the diameter of which corresponded to the diameter of the duct. Multiple fine sutures of nonabsorbable material were used, care being taken not to penetrate the duct lumen. The catheter was withdrawn at the conclusion of the operation.

The author reported successful functional anastomosis in three patients. He uses a postoperative regimen that favors continued secretory activity of the gland. No measures are necessary to prevent stricture at the site of anastomosis.

■ MIKULICZ'S SYNDROME. A. J. Hird. Brit. M. J. 2:411, August, 1949.

The observations on a 73 year old man who presented enlarged salivary and lacrimal glands —Mikulicz's syndrome—are reported. Many features of chronic lymphatic leukemia were present, but the total leukocyte count was not raised. Swelling of the lacrimal and salivary glands was treated satisfactorily with roentgen rays. The results, however, were temporary and death occurred 14 months after initial hospital admission. The literature suggests that the Mikulicz's syndrome is a manifestation of a general involvement of lymphoid tissue rather than a disease of just the lacrimal and salivary glands. The involvement may be caused by lymphatic leukemia, but in many cases there has been only moderate lymphocytosis or no deviation from the normal. Many of these patients will eventually present the full picture of chronic lymphatic leukemia. Instances of the syndrome described in the past as being caused by tuberculosis would probably now be classified as resulting from sarcoidosis, and those ascribed to syphilis leave the impression that the syphilitic state may have been purely coincidental.

■ IRRADIATION AS THE PREFERRED TREATMENT OF CANCER OF THE LIP. G. S. Sharp, H. F. Williams and R. E. Pugh, Jr. J.A.M.A. 142:698, March 11, 1950.

It is the desire for a good cosmetic result which stimulates the use of radiation in the treatment of cancer of the lip. Judgment for the type of treatment is based on the dimensions of the lesion, the depth of invasion, the curability and the cosmetic result possible.

The essential principle is irradiation of as small a volume of normal tissue as is consistent with eradicating the primary growth. In order to accomplish this, the total exposure is divided among several methods of irradiation.

In locations where the growth is accessible, as on the lip, topical radium, alone or in conjunction with interstitial radium needles, offers ideal physical factors to obtain a lethal tumor dose with minimum damage to adjacent tissue. Surface or contact applicator radiation is efficient for early lesions that do not have a depth of invasion of more than 3 mm. Deeply infiltrating and more spherical growths are treated by the combined therapy as suggested by the authors.

A series of 208 patients with cancer of the mucous membrane of the lips as treated from 1932 to 1943 is presented. The absolute percentage of five year cures was 84.2. Surface radium alone was employed in 78.1 per cent, interstitial radium alone in 1.1 per cent, combined topical and interstitial radiation in 11.5 per cent and surgical measures in 9.3 per cent.

Quimby's tables are used to determine the required tissue dose. These tables give the number of gamma roentgens per 100 milligram hours at various distances from uniform sources of various shapes. The writers give detailed examples of the technic and variations in the methods of application of radiation therapy.

■ A HEMOPHILIA-LIKE DISEASE WITH PROLONGED COAGULATION TIME AND A CIRCULATING ANTICOAGULANT; REPORT OF A CASE IN A FEMALE. O. Herman Dreskin and Nathan Rosenthal. Blood 5:46, January, 1950.

A case is presented of hemophilia-like disease, associated with a circulating anticoagulant, in a young woman. The literature is reviewed and this case is the twelfth to be reported, the first being described in 1940. The patient was refractory to treatment with blood and blood products but has made progressive clinical recovery despite a prolonged coagulation time of 76 minutes. Inasmuch as this anticoagulant is not usually present in the blood of a true hemophiliac and also because of the male sex exclusiveness of hemophilia, it was felt that this patient had a different disease—one that might best be called "hemophilioid disease." This disease is proposed as a definite clinical syndrome characterized by hemorrhagic manifestations, prolonged coagulation time and a circulating anticoagulant.

Announcements

■ American Society for the Advancement of General Anesthesia in Dentistry

The fall meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held on Monday evening, October 23, 1950, at the Shelburne Hotel, Lexington Avenue and Thirty-seventh street in New York City.

Max H. Jacobs, M.D., D.M.D., Boston, will present a paper on oral surgery procedures as they are influenced by various anesthetic technics. The dental and medical professions are invited to attend. For further information on this meeting and on society membership, address M. Hillel Feldman, Executive Secretary, 730 Fifth Avenue, New York 19, N. Y.

■ Southeastern Society of Oral Surgeons Elects Officers

The Southeastern Society of Oral Surgeons held its first annual meeting at Atlanta, March 17 and 18, 1950, for the election of officers and members of the executive board.

George C. Albright of Greenville, S. C., was elected president for the current year, with Hunter Harang, New Orleans, as president-elect and Thomas Blair, Winston-Salem, N. C., vice-president. Charles F. Landis, Chattanooga, was named secretary-treasurer and George W. Matthews, Birmingham, editor. Drs. Albright, Harang, Blair and Landis will also serve on the executive board with Thomas Conner of Atlanta, Irwin Hyatt, Atlanta, and Wilbur Davis, Orlando, Fla.

The dates and location of the 1951 meeting will be announced later.

Dental Anesthesia Residency Open at Doctors Hospital, Washington, D. C.

A dental anesthesia residency for selected postgraduate students of dental surgery is offered by Doctors Hospital, Washington, D. C., with the appointment being made each January 1 or July 1. Length of service is for either 6 or 12 months with maintenance.

The student will assist with general anesthesia for surgery and obstetrics and will participate in preoperative and postoperative routine care in the hospital. The appointee will attend anesthesia conferences and lectures at least four hours a week and will participate in daily clinical conferences in the operating room.

This opportunity is offered only to students who are working for a Master's degree or who intend to specialize in oral surgery. The objective of the residency is to give a basic background in anesthesiology with clinical experience in 300 to 750 cases exclusive of dental surgery.

Further information may be obtained by writing to Harold Krogh, D.D.S., 1835 Eye St. N.W., Washington 6, D. C.

■ Postgraduate Course in Orthodontics at Ohio State University

The College of Dentistry, Ohio State University, has announced the addition of a new postgraduate course in orthodontics, with the first class to be admitted in October for the 15 month, full time study.

The dental graduate students will receive instruction in anatomy of the face and neck, oral histology, oral pathology, clinical orthodontics, basic concepts of orthodontics and orthodontic technics. The subjects will be taught by such eminent educators as H. B. G. Robinson, J. R. Hull, R. M. Kincaid, P. C. Kitchin, D. C. Miller, E. R. Wade, E. G. Jones and L. F. Edwards.

Ten applicants will be accepted on the basis of their academic records, professional accomplishments and aims. A certificate will be issued upon satisfactory completion of the course. Applications may be obtained from the Postgraduate Division, College of Dentistry, Ohio State University, Columbus 10, Ohio.

■ School of Dentistry, University of Pennsylvania, Offers Postgraduate Courses

The School of Dentistry, University of Pennsylvania, is offering 36 postgraduate courses in 23 different subjects during the academic year 1950-1951 including several in the field of oral surgery.

Enrolment is limited to members in good standing of the American Dental Association and may be taken under the provisions of Public Law 346. Of particular interest to those specializing in oral surgery will be the subjects of cleft palate treatment, dental surgery and anesthesia, mouth rehabilitation, oral cancer, oral diagnosis and roentgenology and roentgenologic technic and interpretation.

For further information on these courses, address the Director, Postgraduate Courses, School of Dentistry, University of Pennsylvania, 4001 Spruce Street, Philadelphia 4.

■ Maxillofacial Surgeons to Meet in New York City in September

The American Society of Maxillofacial Surgeons will meet in New York for a four-day session beginning September 24. Information as to the program and speakers may be obtained from the society's secretary, Dr. Casper Epsteen, 25 E. Washington Street, Chicago.

■ The American Board of Oral Pathology

The American Board of Oral Pathology will conduct its next examination at Atlantic City, New Jersey, in conjunction with the 1950 meeting of the American Dental Association, October 30 to November 2, 1950. The examination will be both practical and oral. Individuals who contemplate appearing before the board should make arrangements to submit their credentials as soon as possible.

Prospective candidates may secure detailed information by addressing the secretary, Lt. Colonel Joseph L. Bernier, D. C., Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington 25, D. C.

■ West Virginia Society of Oral Surgeons Elects New Officers

Officers elected at the second annual meeting of the West Virginia Society of Oral Surgeons on May 14 are: Edward Armbrecht, president; D. G. Grimm, vice-president; L. A. Stark, secretary-treasurer, and J. Bernard Poindexter, program chairman.

■ Fellowship in Oral Pathology

Lt. Colonel Joseph L. Bernier announces the availability of a Fellowship in Oral Pathology at the Armed Forces Institute of Pathology. The Fellowship is sponsored by the American Dental Association as one of the activities of its Council on Dental Museum and Registry. The Fellowship may be filled at any time and is initially for a one year period from time of appointment. Renewal for a subsequent year is possible. The training received is creditable toward the American Board of Oral Pathology.

For further information write Lt. Colonel Joseph L. Bernier, Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington 25, D. C.

Editorial communications

■ ORIGINAL COMMUNICATIONS—This journal invites concise original contributions in the broad field of clinical and experimental surgery of the mouth and associated structures, including roentgenology, diagnosis, anesthesia and oral surgical pathology. Articles are accepted for publication with the understanding that they are contributed solely to the JOURNAL OF ORAL SURGERY. All manuscripts are subject to editorial modification. Neither the editors nor the publishers accept responsibility for the views and statements of authors expressed in their communications.

■ MANUSCRIPTS—Manuscripts submitted for publication should be sent to Reed O. Dingman, Editor, 221 North Ingalls Street, Ann Arbor, Michigan.

Manuscripts should be typewritten on one side of the paper only, with double spacing and liberal margins. The author's name and the abbreviated title of the article should appear at the top of each manuscript page. The original should be sent to the editor and a carbon copy retained by the author. Manuscripts will not be returned if accepted for publication.

References should be placed at the end of the article and should conform to the style of the Quarterly Cumulative Index Medicus; viz., name of author, title of article and name of periodical with volume, pages, month and year. They should be numbered and should appear in the same order as that of the superior figures inserted in the appropriate positions in the text.

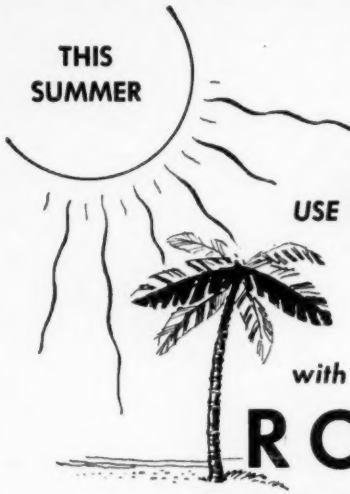
■ ILLUSTRATIONS—Illustrations accompanying manuscripts should be unmounted and numbered. The author's name should appear on the margin or back.

Authors should insert figure numbers at appropriate places in the text. The original drawings, or glossy print photographs of them, should accompany the manuscript. Legends for illustrations are to be typewritten in a separate list with numbers corresponding to those on the photographs and drawings.

A reasonable number of halftone illustrations will be reproduced free of cost to the author, but special arrangements must be made with the editors for color plates, elaborate tables or extra illustrations. Copy for zinc cuts (such as pen drawings and charts) should be drawn and lettered in India ink or with black typewriter ribbon (carbon paper placed with carbon against back of sheet for bolder type). Ordinary blue or colors will not reproduce. Only good photographic prints or drawings should be supplied for halftone work.

■ CASE REPORTS—Case reports will constitute an important department of the journal and the editors welcome case reports that are of unusual clinical value or that present exceptional conditions of interest to dental surgeons.

■ EXCHANGES—Letters, exchanges, reprints and all other communications relating to the JOURNAL OF ORAL SURGERY should be sent to the American Dental Association, 222 East Superior Street, Chicago 11.



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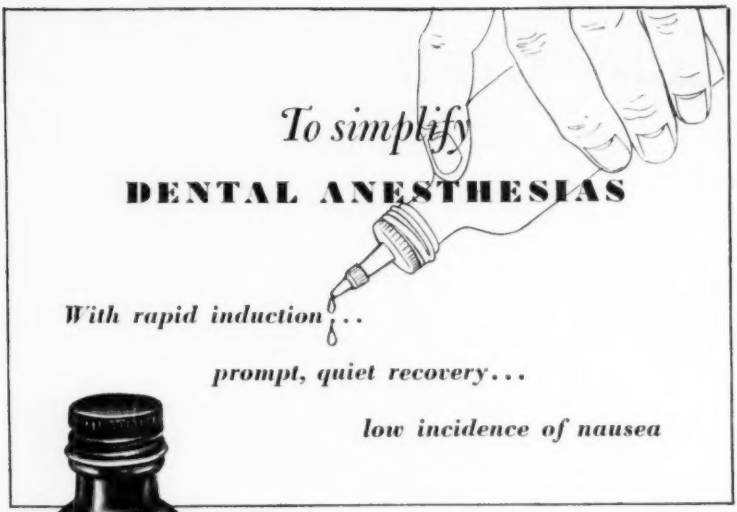

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